THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXVI. No. 652.] LONDON, NOVEMBER 9, 1875. [27TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 12¼ cwt. coke per ton of coal.
The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.
RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1838. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 39, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.
Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.

GENUINE TORBAY PAINT
AND
SPECIAL GASOMETER PAINT
(Mixed ready for use).
These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.
They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
STEVENS & CO.,
(SUCCESSORS TO SAMUEL CALLEY. ESTABLISHED 20 YEARS.)
21, GT. WINCHESTER ST., LONDON.
WORKS: BRIXHAM, TORBAY.

PROUD'S
SPECIALITIES IN WOOD GRIDS
FOR
PURIFIERS & SCRUBBERS
MADE FROM THE BEST QUALITY
OF
WELL-SEASONED PLANKS.
SCRUBBERS FITTED WITH MR. LIVESEY'S BOARDS AT MODERATE COST.
BROOKFIELD WORKS,
103, ICKNIELD STREET EAST, BIRMINGHAM.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and other OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Coal Office,
QUAY SIDE, NEWCASTLE-ON-TYNE.
JOS. COWEN & Co. are the only Manufacturers of FIRE-BRICKS and CLAY RETORTS at BLAYDON BURN.

JOHN RUSSELL AND CO.,
THE WEDNESBURY TUBE-WORKS, WEDNESBURY;
AND
THE ALMA WORKS, WALSALL.
Established at the commencement of Gas Lighting.
WAREHOUSES:
69, UPPER THAMES STREET;
COMMERCIAL STREET, SPITALFIELDS;
5, CHARLES STREET, SOHO; and
16, SOHO SQUARE,
} LONDON
35, 36, 37, & 39, GRANBY ROW, MANCHESTER.
J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.
J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.
Lists may be obtained on application to
69, UPPER THAMES STREET, LONDON.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
OF
FIRST-CLASS MATERIALS & WORKMANSHIP;
Also, STATION-METERS, PRESSURE-GAUGES, STREET-LAMPS, REGULATORS, &c.
ESTABLISHED 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM.
MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
Roofs, Girders, and Bridges, and General Smith's Work.
LONDON AGENT—W. G. DAVIS, 2, Brabant Court, Philpot Lane, E.C.

J. & H. ROBUS,
CONTRACTORS
FOR THE
ERECTION OF NEW & REMODELLING OF EXISTING GAS-WORKS.
RETORT-SETTING A SPÉCIALITÉ.
RETORTS SET, AND GUARANTEED TO BURN OFF A CERTAIN AMOUNT OF COAL, OR ELSE NO MONEY TAKEN FOR THE CONTRACT.
PLANS ON APPLICATION.
Retort-Setters sent to all parts of Europe and America.
Address, J. and H. ROBUS,
BELL GREEN, CATFORD, LONDON, S.E.

THE
NITSHILL COMPANY'S
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.

GEORGE GLOVER & CO.,
MANUFACTURERS OF
IMPROVED DRY GAS-METERS,
WARRANTED TO MEASURE CORRECTLY, AND NOT TO VARY.

EXTENSION OF PREMISES.

G. G. & Co. having had their premises entirely rebuilt, are now fairly in possession of large and commodious workshops, specially adapted to the requirements of the trade, and they are prepared to execute orders, large or small, with promptness and despatch.

THEY KEEP IN STOCK METERS OF ALL SIZES, UP TO 300 LIGHTS.

RANELAGH WORKS, RANELAGH ROAD, PIMLICO,
LONDON, S.W.;
236, GEORGE STREET, GLASGOW; and 30, LANCASTER AVENUE, MANCHESTER.
AGENT FOR AUSTRALIA:
Mr. A. DEMPSTER, POST-OFFICE PLACE, MELBOURNE.

G. G. & Co. have just been awarded a SILVER MEDAL for Gas-Meters and Gas Apparatus at the Exhibition of the "Society for the Promotion of Scientific Industry," Manchester.

SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS

AND

LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES.

Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools.

London Offices: No. 4, Cloak Lane, Queen Street, E.C.

WAREHOUSES:

LONDON: 157, UPPER THAMES STREET, E.C.

LIVERPOOL: No. 63, Paradise Street.
MANCHESTER: Barlow's Croft, Chapel Street, Salford.
PARIS: No. 38, Rue du Chateau d'Eau.
LILLE: No. 38, Rue Grande Chaussee.

LAMBERT BROTHERS, WALSALL.

ALPHA TUBE & FITTING WORKS

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

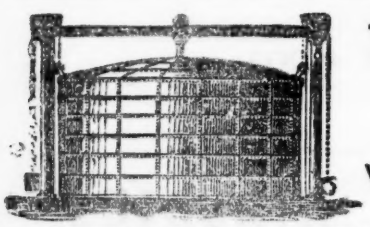
Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.



W. C. HOLMES & CO.,

WHITESTONE IRON-WORKS, HUDDERSFIELD

MANUFACTURERS OF

RETORTS, ANNULAR AND PIPE CONDENSERS,
WROUGHT AND CAST IRON SCRUBBERS, PURIFIERS,
GASHOLDERS,

GOVERNORS, AND ALL THE NECESSARY FITTINGS FOR COMPLETING THE ERECTION OF GAS-WORKS.

STATION & CONSUMERS WET OR DRY METERS, STREET & SERVICE MAINS, LAMP COLUMNS & BRACKETS, & WROUGHT-IRON TUBES AND FITTINGS; WROUGHT-IRON ROOFS FOR ANY SIZE OF BUILDINGS.

Sole Makers of B. W. Thurston's Combined Condensing, Scrubbing, and Washing Apparatus,

AND PATENTEES OF THE IMPROVED COMBINED CONDENSING AND PURIFYING APPARATUS SO EMINENTLY ADAPTED FOR EXPORTATION.

REFERENCES TO UPWARDS OF 300 GAS-WORKS.

LONDON OFFICES: 92, CANNON STREET.

Established

1795.

JOSEPH CLIFF & SON,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

MANUFACTURERS OF ALL DESCRIPTIONS OF

FIRE GOODS, and Salt-Glazed Drain-Pipes.

LONDON WHARF:

Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL—1, Back Leeds Street,

Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

WHITEHOUSE AND COMPANY, LIMITED,

GLOBE TUBE-WORKS, WEDNESBURY; & VICTORIA TUBE-WORKS, GREAT BRIDGE, STAFFORDSHIRE,

MANUFACTURERS OF

PATENT WELDED WROUGHT-IRON TUBES,

FOR GAS, STEAM, AND WATER;

GAS-FITTERS TOOLS, STEAM COCKS, AND ALL KINDS OF JOINTS.

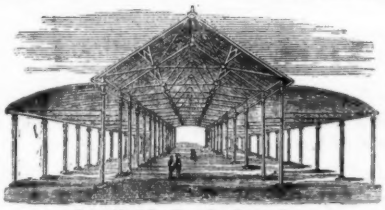
HYDRAULIC TUBES, CORE BARS, TELEGRAPH POSTS, COILS, &c.

London Agent—ALFRED LAKEMAN, 9, FENCHURCH STREET, E.C.

FRANCIS MORTON & CO., LIMITED, NAYLOR STREET, LIVERPOOL.

ESTABLISHED OVER A QUARTER OF A CENTURY.

ENGINEERS, GOVERNMENT CONTRACTORS, & MANUFACTURERS OF GALVANIZED CORRUGATED IRON ROOFS,



Open Shed for Covering Large Areas.

BUILDINGS, AND SHEDDING,

For which Estimates will be given on application,

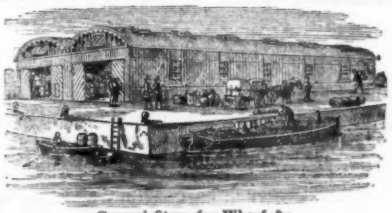
ERECTED COMPLETE IN THIS COUNTRY

OR

PREPARED TO PLAN FOR ERECTION ABROAD,

EITHER WITH

TIMBER FRAMING or WHOLLY in IRON.



General Store for Wharf, &c.

GALVANIZED or PAINTED CORRUGATED IRON ROOFING PLATES and TILES. HEAVY CORRUGATED IRON PLATES for FIREPROOF FLOORS, ROADWAYS, PARAPETS, &c. WROUGHT-IRON TANKS, GUTTERING and CONSTRUCTIONAL WROUGHT IRONWORK.

Designs prepared, and Illustrated Descriptive Catalogue forwarded on application.

LONDON OFFICE: 1, DELAHAY STREET (First door out of Great George Street), WESTMINSTER, S.W.

FLETCHER AND MURPHY,

GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER;

Manufacturers of

IMPROVED CONSUMERS WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

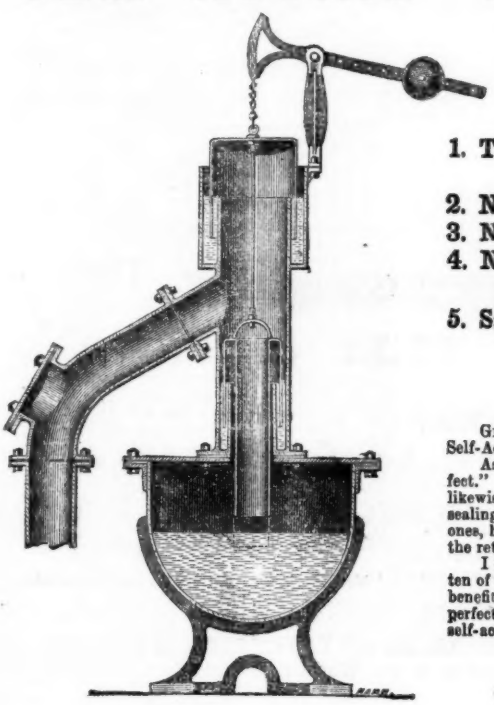
GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS.

And all kinds of Experimental Gas Apparatus.

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

TESTIMONIAL.

Metropolitan District Asylum, Caterham, Surrey, Dec. 14, 1874.

MESSRS. CHANDLER AND STEVENSON.

GENTLEMEN,—I have much pleasure in bearing testimony to the complete working of your "Patent Self-Acting Dip-Pipes," which have now been in constant operation over three months.

As regards the action of the apparatus, I can describe it no better than by calling it "simply perfect." Immediately the retort is charged and the lid secured, the small holder rises, which lifts the Dip; likewise the instant the gas is permitted to escape at the mouthpiece the holder falls, thus perfectly sealing the Dip. I am fully convinced of the superiority of these Self-Acting Dips over Non Self-Acting ones, having experienced the fact that stokers do occasionally neglect to unseal the Dip after charging the retort, thereby causing a waste or loss.

I feel that it is quite unnecessary for me to say more on the subject, excepting that, having had ten of Messrs. Chandler's Dip-Pipes in use more than one year, and having experienced the great benefits derived thereby, inasmuch as the yield of gas from the coal is greatly increased, and the retorts perfectly free from carbon and other advantages, and seeing that the same Dip has been made perfectly self-acting by the second patent, I feel convinced that this is the right thing.—Yours obediently,

W. CRICKMAY, Resident Engineer.

For terms of use and cost, apply to Mr. G. W. STEVENSON,

4, WESTMINSTER CHAMBERS, VICTORIA STREET, S.W.

THE

IMPERIAL METER COMPANY,

LIMITED,

KING'S ROAD, LONDON, N.W.,

OFFICE: 9, VICTORIA CHAMBERS, WESTMINSTER, S.W.,

MANUFACTURERS OF

"WET" & "DRY" GAS-METERS IN IRON & TIN-PLATE CASES,

STATION-METERS AND GOVERNORS, STREET-LAMP METERS, BOXES, AND REGULATORS FOR THE AVERAGE METER SYSTEM.

TO GAS COMPANIES, ENGINEERS, &c.

These Works are in full operation, and it will be the aim of the New Company not only to keep up the excellent workmanship of their predecessors, but, by the introduction of special machinery, to manufacture **Meters of a higher standard than is usually given, without increasing the cost.**

Special attention is invited to the Compensating Wet Gas-Meter of De Castro and Burton, which is now becoming so generally adopted, and is more simple in construction than any other Compensating or Ordinary Wet Meter. There is but one centre of friction to be overcome by the gas. By its self-adjusting principle it maintains an unvarying water-line; and the reservoir contains sufficient water to supply the Meter for twelve months without attention. It is unaffected by "tilting," and cannot be "flooded" by any pressure.

The Company also manufacture Dry Meters upon the most improved principle, and all their Meters being made to standard gauges, the most accurate measurement is obtained.

Attention is also called to their Dry Meters in Wood Cases, as used by some of the London Gas Companies. These Cases are a great preservation to Tin-plate Meters, especially in seaport towns, where the air is impregnated with salt; they are also particularly suited for export.

The Company repair or convert every description of Wet Gas-Meters to De Castro and Burton's Patent.

SIDNEY LEONI & CO.,

GAS ENGINEERS,

Patentees and Manufacturers of Registered Apparatus for Cooking and Heating by Gas, Complete Kitcheners for Families, Hotels, Clubs, &c. Ovens for Baking and Roasting. Grillers for Broiling. Boilers and Steamers for general use. The New Patent Tubular Safety Gas Boiler; also Heating and Ventilating Stoves, besides other Culinary and Warming Apparatus of their invention, and for which they have been awarded Prize Medals in 1871, 1872, 1873, and 1874.

They have also just been awarded by the Jurors of "The Exhibition of Appliances for the Economy of Labour," now being held at Manchester, the

GOLD MEDAL

For their collection of Patent Atmospheric Gas Apparatus, comprising New Patent Kitcheners for Roasting, Baking, &c., Steamers, Bath Boilers, Heating and Ventilating Stoves, Ornamental Drawing and Dining-room Fire Grates, and other Gas Apparatus, for their novelty, design, workmanship, and utility.

For Pamphlets on the "Advantages of Cooking and Heating by Gas," and Price Lists, &c., apply at the

ADAMAS WORKS,

54 to 66, ST. PAUL'S ST., NEW NORTH ROAD,

LONDON, N.

S. LEONI AND CO.,

MANUFACTURERS TO THE METROPOLITAN DISTRICT ASYLUM BOARD, TO THE LONDON, GUY'S, ST. LUKE'S, AND OTHER HOSPITALS; ST. PAUL'S CATHEDRAL SCHOOLS AND MARLBOROUGH COLLEGE, &c.; TO THE EMPRESS OF AUSTRIA, THE COUNT OF FLANDERS, &c.

London Depot:

74, STRAND, ADELPHI, W.C.

Sole Licensees and Agents in Great Britain for

GIROUD'S

PATENT RHEOMETER.

This Instrument is easily fixed under any burner; it regulates the volume of gas to be consumed, notwithstanding the size of the burner or the variations of pressure.

PRIZE MEDALS, 1862, 1867, 1871, 1874, 1875.

LEONI'S

Patent Heating and Ventilating Stoves, under Ornamental China Covers.

The Heat Reflector absorbs and tempers the heated air, and prevents the unpleasant sensation of closeness. Over 1000 of these Stoves now in use.

"New Registered Pattern" Cheerful Fireside.

Dimensions—No. 54, 1 ft. 6 in. by 1 ft. 3 in., and 2 ft. high. No. 55, 2 ft. by 1 ft. 5 in., and 2 ft. 2½ in. high.

SOLE AGENTS and MANUFACTURERS of LOOKER'S PATENT WARMING and VENTILATING GAS-STOVES.

(Special Illustrations and Prices on application to our Works.)

WILLEY AND FORD,

GAS ENGINEERS,

WORKS: COMMERCIAL ROAD, EXETER,

INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF

EVERY DESCRIPTION OF GAS APPARATUS.

ENGINEERING DEPARTMENT.

NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

GASHOLDERS AND TANKS.

RETORTS and RETORT-HOUSE FITTINGS, CONDENSERS, SCRUBBERS, ENGINES and EXHAUSTERS, PURIFIERS, STATION-METERS, GOVERNORS, VALVES, &c.

METER DEPARTMENT.

They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

GAS-FITTING DEPARTMENT.

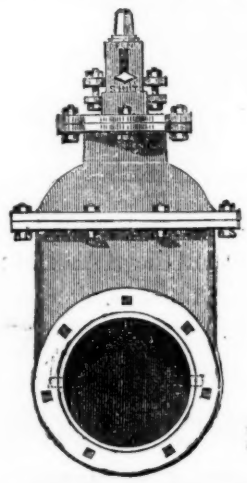
An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

☞ PLEASE NOTE THE ADDRESS–

GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.

C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves are superseding the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

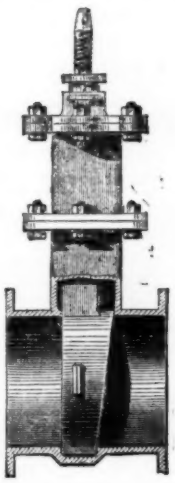
They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

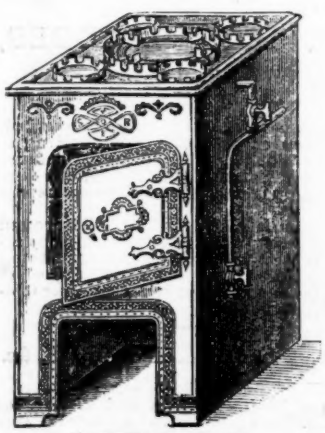
A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.



MIDLAND IRON-WORKS,
DONNINGTON, near NEWPORT, SHROPSHIRE;
8, FINSBURY CIRCUS, LONDON.



"SOYER"—No. 75.
15 in. wide, 27 in. high, with Dripping Pan, Gridiron, and Terra Cotta Radiator. Price £3 10s.

No. 77.
18 in. wide, 36 in. high.
Hot Plate, 24 in. by 21 in. Price £5.

SCOTT, BROWN, & CO.,

(LATE SCOTT AND BUTLER,)

CUMBERLAND WORKS, VITTORIA ST., BIRMINGHAM,

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS

FOR CULINARY AND DOMESTIC USE.

FOR EXCELLENCE OF DESIGN AND FINISH, COMBINED WITH GENERAL UTILITY AND EFFICIENCY, OUR GOODS ARE UNRIVALLED.

THE NEW REGISTERED "PARAGON" BOILING-STOVE

(From 2s. 3d. to 10s.)

IS THE MOST PERFECT ARTICLE OF THE KIND YET INTRODUCED.

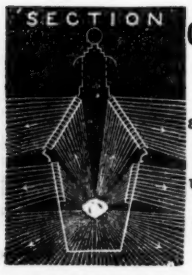
PRICES AND TERMS ON APPLICATION.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of
CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

CAFFALL, THOMAS, & CO.,
LIMITED,
Are prepared to supply and erect their
PATENT MOVEABLE SEALS
FOR DIP-PIPES,
Or to grant Licences for the Manufacture and Use of the same.
Particulars may be obtained on application at the Offices,
75, FLEET STREET, LONDON, E.C.

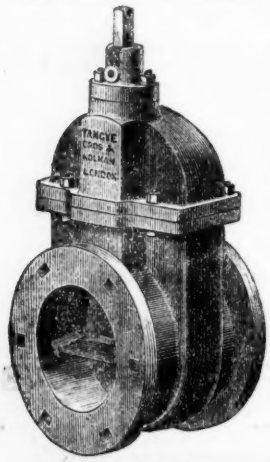
THOMAS READ & CO.,
BRAZILIAN IRON-WORKS,
MALTON, YORKS,
MANUFACTURERS OF
GAS and WATER PIPES,
Bends, Tees, and Irregulars,
AND
GENERAL FOUNDERS.
ESTIMATES and PRICES on APPLICATION.

C. & W. WALKER,
MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE,
MANUFACTURERS OF
TELESCOPIC AND SINGLE-LIFT
GASHOLDERS,
CAST & WROUGHT IRON GASHOLDER-TANKS,
CONDENSERS, SCRUBBERS, & PURIFIERS.
LONDON: 8, FINSBURY CIRCUS, E.C.



THE PATENT
CATOPTRIC LAMP
Is now in use in Moorgate Street, Cheapside, and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.
T. A. SKELTON, 37, Essex St., Strand, LONDON,
INVENTOR AND PATENTEE.

IMPROVED
GAS-VALVES,
AT GREATLY
REDUCED
PRICES.

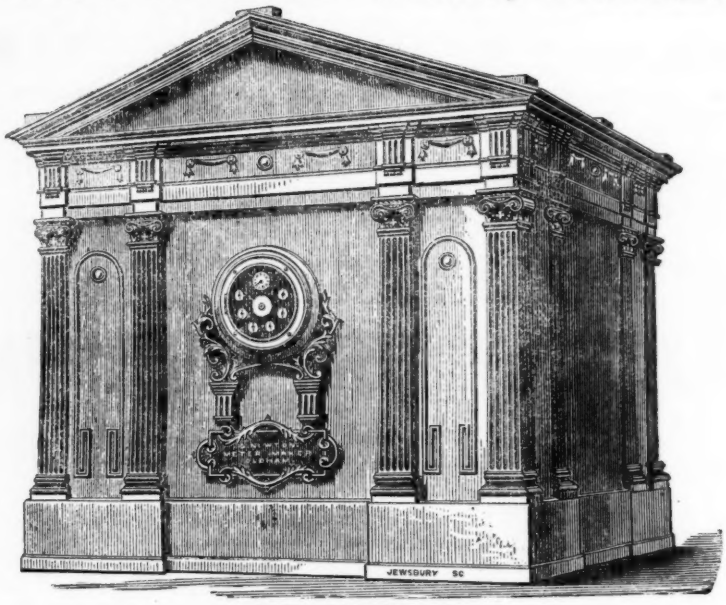


Inch.	s.	d.
3	25	0
4	36	0
5	40	0
6	54	0
7	63	0
8	80	0
9	85	0
10	100	0
12	120	0
14	140	0

TANGYE BROS. & HOLMAN,
LAURENCE POUNTNEY LANE,
LONDON.

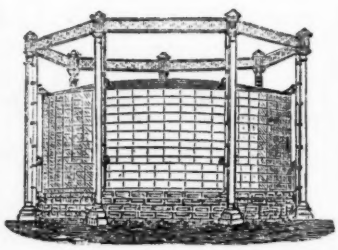
ALFRED WILLIAMS,
PHŒNIX FIRE-BRICK WHARF,
64, BANKSIDE, SOUTHWARK, LONDON, S.E.
GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,
AND FOR THE
SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,
AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.

GEORGE NEWTON,
UNION STREET WEST, OLDHAM,



MANUFACTURER OF
SQUARE STATION-METERS, with PLANED JOINTS;
ROUND STATION-METERS, WITH CAST-IRON STANDS;
WET AND DRY CONSUMERS GAS-METERS, GOVERNORS, &c.

SAM. CUTLER & SONS,
CONTRACTING GAS ENGINEERS,
GASHOLDER & GENERAL GAS APPARATUS MAKERS,
MANUFACTURERS OF
BOILERS, IRON ROOFING, IRON BRIDGES,
AND GENERAL IRONWORK.



S. C. AND SONS undertake Contracts of any magnitude for the **Erection of new and Remodelling of existing Gas-Works**, for **Gasholders, Cast and Wrought Iron Tanks, Iron Roofs**, and every description of **Apparatus** for the Manufacture and Distribution of Gas.
Special attention is invited to their **"Improved Condenser,"** which is very effective, and much approved; also to their patterns of **Annular** and other **Condensers, Scrubbers**, and **Purifiers**, of all sizes, which they arrange either with **Centre** or Ordinary **Slide Valves.**
WORKS FOR THE SUPPLY OF
VILLAGES, MANSIONS. FACTORIES, &c.

S. C. AND SONS undertake the **Supply** and **Laying** of **Mains** for **Gas and Water**, and supply all Castings, Connexions, and Fittings for Retort-House, Works generally, and for Streets. They also supply **Valves** of all descriptions, Iron and Clay Retorts, Hotpressed Retort-Lids, Steel Charging-Scoops of improved make, for which they have special machinery, Improved Coke and Coal Barrows, Cross-Bars and Screws, Bolts and Nuts, Furnace and Stoking Tools, Iron and Wood Purifier-Sieves, Lead, Yarn, Borings, &c., including every requisite whatsoever for a Gas-Work, a well-assorted stock being kept of those goods most in request.
SOLE MAKERS OF BRETT'S PATENT COKE BARROW.
Experienced Retort Setters sent to any part of the Kingdom.
Address: **PROVIDENCE IRON-WORKS, MILLWALL, LONDON.**

TANGYE BROTHERS AND HOLMAN,

LAURENCE POUNTNEY LANE, LONDON, E.C.,

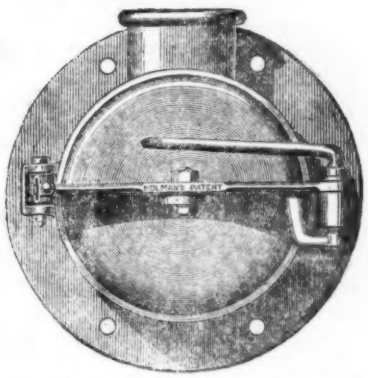
SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH

HOLMAN'S NEW PATENT BRACKETED CROSS-BARS,

Anti-Friction Catches and Eccentric Fastenings.



INSTANTANEOUS SEALING EFFECTED.
NO LUTING. NO DUPLICATE LIDS REQUIRED.
HOLMAN'S NEW SELF-SUSTAINING CROSS-BAR ENSURES FREEDOM OF JOINT AND MAINTAINS PARALLEL POSITION OF THE LIDS.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested (rigid cast iron is now successfully employed), nearly 20,000 being in use at various Gas-Works in London and the Provinces, among which may be mentioned:—

The Gaslight Co., Beckton (where, by the end of 1875, nearly 4000 will be in use).
" Gaslight Co., Bow Common.
" Gaslight Co., Silvertown.
" Gaslight Co., Lupus Street.
" London Gaslight Co.
" Independent do.
" Phœnix do.
" South Metropolitan Gaslight Co.
" Commercial do.
" Imperial do.
" West Ham Gas Co.
" Gas-Works, Barnet.

The Gas-Works, Royal Arsenal, Woolwich.
" do. Lower Sydenham.
" do. Brentford.
" Consumers Gas Co., Woolwich.
" Alliance and Dublin Gas-Works.
" Edinburgh do.
" Manchester Corporation do.
" Salford do. do.
" Rochdale do. do.
" Liverpool Gas-Works.
" Birmingham do.
" Birkenhead do.
" Nottingham do.

The Newcastle-on-Tyne Gas-Works.
" Lurgan do.
" Carmarthen Gas-Works.
" Merthyr Tydfil do.
" Windsor do.
" Leeds do.
" St. Albans do.
" Over Darwen do.
" Rotherham do.
" Aylesbury do.
" Bournemouth do.
" Ystrad do.
" Cardiff do.
" Rochester do.

The Keighley Gas-Works.
" Aberdare do.
" Ballymena do.
" Richmond do.
" Stalybridge do.
" Longton do.
" Exeter do.
" Ross do.
" Falmouth do.
" Barrow-in-Furness do.
" Belfast do.
" Wakefield do.
And other Provincial and Foreign Gas-Works.

IMPORTANT TESTIMONIAL.

The Gaslight and Coke Company (Commonly called the Chartered Gas Company), Beckton, North Woolwich, July 2, 1874.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—In answer to your inquiry respecting the Self-Sealing Lids, I beg to say that they continue to work well, and I have every reason to be satisfied with them.

I should be very sorry to return to the old system of Luting, and our stokers here freely acknowledge the benefit to them of the new system.

I am, yours truly,
(Signed) G. C. TREWBY.

VIENNA EXHIBITION, 1873.—The highest prize and only Medal "for Progress" for Direct-Acting Steam Pumps for general purposes was awarded to TANGYE BROTHERS AND HOLMAN, Engineers, London, for

THE "SPECIAL" DIRECT-ACTING STEAM PUMPS.

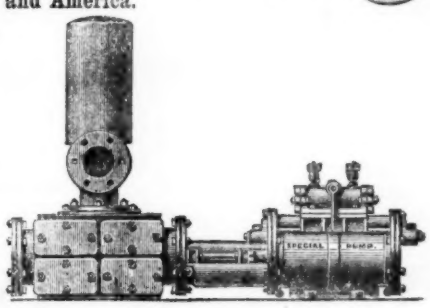
Upwards of 12,000 have been sold in England and America.

In use in upwards of a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Intending Purchasers are particularly requested to observe the great length of stroke of these Pumps, as compared with the short stroke of Pumps of other makers, as the durability of the machine greatly depends upon this.

The following sizes are those usually supplied to Gas-Works. Those marked, * being usually selected for pumping Tar and Liquor, are nearly always in stock, fitted up expressly with Pump details in iron, and extra length distance-piece between steam and pump cylinders, at a small extra cost.

Diameter of Steam Cylinder . in.	3	*4	*5	*6	5	*7	6	*8	7	*10	10
Diameter of Water Cylinder . „	1¼	2	3	4	5	5	6	6	7	7	8
Length of Stroke . . . . . „	9	9	12	12	12	12	12	12	12	12	18
Gallons per hour approximate .	450	815	1830	3250	5070	5070	7330	7330	9750	9750	13000
REDUCED PRICES. . . .	**£16**	**£18**	**£22 10**	**£30**	**£27 10**	**£40**	**£40**	**£50**	**£50**	**£65**	**£75**

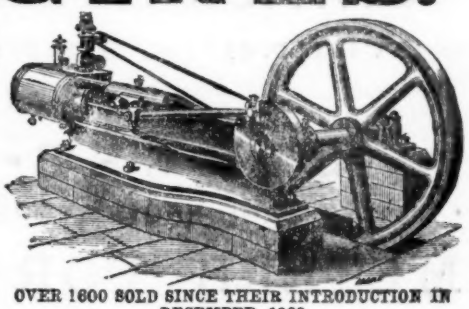


TANGYE'S HORIZONTAL HIGH-PRESSURE EXPANSIVE

STEAM-ENGINES.

In designing this Engine the utmost regard has been paid to simplicity of arrangement, strength of construction, and economy in cost. The working parts are considerably reduced in number, as compared with Horizontal Engines generally, rendering it far more durable and compact, the bed-plate, front cylinder cover, guides, and plummer-block for crank-shaft bearing being all cast in one piece, which in design and proportions is admitted by competent engineers to be perfect, and to afford a strength and rigidity that cannot possibly be attained in the best fitted engines of the ordinary horizontal type. The extraordinary stiffness of this Engine will permit of its being driven at a much greater maximum speed than engines generally, and with far less wear and tear. The cylinder with its valve-chest is bolted to the end of the bed. The cross-head slippers and connecting-rod ends are made adjustable, so that any wear can be readily taken up. The fly-wheel, cylinder-end, connecting-rod, and crank-plate, are all bright. All the parts are made to Whitworth's Gauges, and the material and workmanship are of the highest class throughout.

The Governor is of a very special description, and combines in the small space usually occupied by the ordinary steam stop-valve, a governor, throttle-valve, and stop-valve complete. It is exceedingly sensitive, simple, and compact.



These Engines are adopted in Gas-Works at Greenwich (Phœnix Gas Co.), Haggerston (Independent Gas Co.), Nine Elms (London Gas Co.), Falmouth, Harrow, Jersey, Plymouth, Richmond, Rochdale, Santiago (Chili), &c.

OVER 1600 SOLD SINCE THEIR INTRODUCTION IN DECEMBER, 1869.

London 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

MANUFACTURERS OF PATENT

WET & DRY GAS-METERS,

STATION-METERS WITH PLANED JOINTS,

GOVERNORS, PRESSURE REGISTERS, GAUGES,

AND EXPERIMENTAL APPARATUS,

STREET-LAMP METERS,

AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

CONTENTS.

	Page
Circular to Gas Companies:—	
The Meeting of the South Metropolitan Gas Company	681
The Sliding Scale v. the Revision Clauses	681
Discussion in the Court of Common Council	681
The Sale of Mr. Brushfield's Gas Property	682
Gas Affairs at Swansea	682
Gas Affairs at Fleetwood	682
The Liverpool Gas Company and the Damages to the Landing Stage	682
Proposed Purchase of the Llandudno Gas and Water Works	682
Gas Affairs at Dundee	682
Water and Sanitary Notes:—	
A Scheme for the Drainage of the Thames Valley	682
The Drainage of the Lea Valley	682
The Metropolitan Board and the Artizans Dwellings Act	682
The Application of "Torrens's Act"	682
Leading Article:—	
A Treatise on the Science and Practice of the Manufacture and Distribution of Coal Gas	683
Correspondence:—	
Gas-Exhausters	686
"Exhausters" or "Propellers?"—and what is "Permanent Gas?"	686
Untrussed Gasholders	687
Freezing of Gasholder Lutes	687
Station-Meters without Cases	687
Miscellaneous News:—	
Sale of Metropolitan, &c., Gas and Water Shares	683
Metropolis Gas Supply	687
Metropolis Water Supply	688
Halifax Corporation Gas and Water Works	689
Death of Mr. John Wright	689
Pontypool Public Lighting	689
Meeting of the South Metropolitan Gaslight and Coke Company	690
Meeting of the Odessa Water-Works Company	692
Aberdeen Corporation Gas Supply	692
Pollution and Purification of Rivers. By M. A. Gérardin	693
Gas-Meters on the Principle of Saturation	696
Iron and Coal Trades of Sheffield, South Yorkshire, and North Derbyshire	697
Iron and Coal Trades of South Staffordshire and East Worcestershire	697
Iron and Coal Trades of Lancashire	697
Coal and General Trade of the North	697
Trade Notes from Scotland	697
Suicide of a Gas Manager	698
Charge of Conspiracy by Gas Stokers	698
Reductions in the Price of Gas	698
Fire at the South Shields Gas-Works	698
Swansea Gas Supply	698
Register of New Patents:—	
Applications for Letters Patent	698
Grants of Provisional Protection	698
Notices to Proceed	698
Patents which have passed the Great Seal	698
Patents which have become void	698

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 9, 1875.

Circular to Gas Companies.

We mentioned last week that the shareholders of the South Metropolitan Company had passed a resolution approving the principle of the Regulations Bill, and announcing the intention of the company, if this Bill should not become law next session, to promote, on their own account, a measure including its principal provisions, with additions which will be found detailed in another column. It has been said by us all along that the Regulations Bill offers special and peculiar advantages to the South Metropolitan Company, and, therefore, we are not at all surprised that a majority of the shareholders should be in love with its provisions. The Bill is, in fact, a measure for putting a premium on the company's shares. Captain Heathorn expressed this in the most outspoken manner. If, he said in effect, we are bought up to-day, we must go for what we are worth, as a 10 per cent. company; but if this Bill should pass, we shall become a 12 or 14 per cent. company, and the terms of purchase must be settled accordingly. This is quite true; but more anon.

If, as we are informed, the directors of the Chartered Company are inclined to adopt the principle of the sliding scale of dividend, and the Imperial Company should have followed suit before these lines meet the reader's view, that shall not prevent us from repeating a strong and confident opinion that the legislation of 1868-69 offers the best security for both companies and consumers. And here we must be forgiven if to-day we argue the question chiefly from the consumers point of view.

It has never been urged in these columns that the gas companies are absolutely entitled to a 10 per cent. dividend. The law originally fixed a maximum price for gas, and said that if with this price, or anything lower, 10 per cent. could be made, so much might be divided, but no more. The legislation of 1868-69, thanks to the local authorities, did, for the first time, practically guarantee a 10 per cent. dividend; but, at the same time, it maintained the principle that if more than 10 per cent. was made at the maximum price or under, the surplus profit should go in reduction of price.

Now, what is about to happen? If all go well, and, as we have said, in absence of disturbing causes, under the operation of the legislation we have mentioned, the price of gas throughout the Chartered Company's district will most likely be reduced to 3s. 6d. per 1000 feet. Thus the consumers will receive the whole benefit of the reduced cost of production.

But what would happen if the sliding scale was in operation? The reduction of 3d. per 1000 feet would allow the directors to divide an additional three-quarters per cent., which the old legislation expressly provided should go into the pockets of the consumers. In the case of the South Metropolitan, the consequences would be still more marked. Supposing the standard price fixed at 3s. 9d., the company could now divide 12½ per cent., and 2½ per cent. of this, the present law says, ought to go in reduction of price. There is no question, in our minds, as to which law is more advantageous to consumers.

But, then, there are the revision clauses, which practically guarantee the 10 per cent. The outcry against these has been like the complaints of spoilt and selfish children, who thought only of their own interests. Up to this time, it is true—and, we will add, very properly so—that these clauses have only operated to the advantage of gas companies. But they have a double operation, and we are sure that Mr. Livesey will forgive us if we now recommend the Camberwell Vestry, or any others whom it may concern, to apply to the Board of Trade to reduce the price of South Metropolitan gas to 2s. 10d. next year, leaving the company their 10 per cent., with which, we make bold to say, they ought to be perfectly satisfied.

Our loyalty to gas companies cannot be questioned; but, in advocating their rights, we have never lost sight of the interests of consumers, and we now frankly and boldly, in face of the action about to be taken by the larger companies, advise the public to stand by the old legislation.

A very interesting discussion on gas affairs took place at the last meeting of the Common Council of the City of London, which will be found reported in another column. It occurred on the bringing up of a report from the Special Gas Committee, as to their proceedings during the present year. We need hardly say much of the speech of the chairman of the committee on moving the adoption of the report; but we may note with satisfaction that he has fallen in with the late Mr. Barlow's suggestion of having the local authorities represented in the direction of the amalgamated companies. No suggestion of "*Government nominees*" has ever been made in our columns, and we have never heard of any such in connexion with gas companies. Municipal nominees are, however, known, and it was from an experience of these that Mr. Barlow expressed the opinion which we quoted a fortnight ago.

It is clear that there is not perfect unanimity in the Common Council as to the advantages of the sliding scale. There are, evidently, some members who hold an opinion similar to that expressed above. A suspicion seems to exist in some minds that the Regulations Bill, if it become law, would fix the price of gas at 3s. 9d. That could not be the case, but the argument that it would be, is worth something. There will soon, as we have said, probably, be a reduction of price in the City of London, and, under the Act of 1868, this reduction will be entirely for the benefit of the consumer. This will be the result of the operation of the much-abused Act of 1868. It is, moreover, possible, but not very probable, that gas, under the operation of the same Act, might be sold in the City for 3s. per 1000; but we very much doubt whether it ever would be, if the sliding scale were in existence. The first object of a company under the sliding scale would be to acquire a large reserve-fund, and we venture to think that there can be no greater temptation to extravagance than a large reserve-fund. The Chartered Company, we are told, propose to adopt the sliding scale, and they are about to issue forthwith another half million of capital at 10 per cent. They want the money, no doubt, and we firmly believe that it will be judiciously and economically expended; but we may take it for certain, that when they accept the sliding scale, they have expectations of making more than 10 per cent., which they cannot do under the present law.

The Gas Committee of the Corporation of London have now been instructed "to compare the proposed Regulations Bill with "the City of London Gas Act, 1868, and report wherein it "would benefit the citizens that the latter should be re-"pealed and the former substituted." If the comparison be fairly made, we have no doubt what conclusion the committee will come to. Let them take the speech of Mr. Bontems, reported in our issue for December 8, 1868, and, excluding the years during which revision prices have been levied, let them fairly inquire whether or not the statements made by Mr. Bontems have been borne out by actual experience. It was pointed out in our "Circular," at the time, that Mr. Bontems's figures somewhat exaggerated the benefit the citizens would derive from the Act of 1868. But the fact remains that a large

and immediate relief to consumers in the City was the result of the operation of the Act. The Corporation spent something like £20,000 in obtaining that Act. It came into force on Oct. 1st, 1868, and we have the direct testimony of Mr. Dresser Rogers, at a meeting of the Common Council on the 26th of the following month, that at that date the amount of money the Act cost had been returned to the City. He added, "One half year of the "working of the new Act will entirely return the whole amount "in the shape of benefit to the citizens at large." The prophecy was undoubtedly realized.

But afterwards came the disastrous years, during which the revision clauses, forced upon the companies, were brought into operation. From what has gone before, it will be clearly seen that we advocate the retention, in future legislation, of revision clauses and 10 per cent.—a figurative expression for full dividends—in preference to a sliding scale, which may confer an exaggerated value on some—it may be all—the undertakings. We do so honestly and sincerely. Full dividends, as they are at present fixed, are all that a gas company can reasonably desire.

We started with the announcement that to-day we should argue the metropolitan gas question from a consumers and a ratepayers point of view. We have done so honestly and conscientiously. Purchase by some municipal authority is an eventuality which everybody contemplates, Under the present law, that may be effected on the basis of 10 per cent., or rather, full statutory dividends. If the sliding scale should be in operation for some years, and coal become cheaper, there is no knowing what shares or stock may be worth.

One word more on revision clauses. We are constantly referring to and commending the Scottish system, under which the price of gas is fixed according to the cost of production. Now, the proceedings before Revising Commissioners are exactly comparable—barring the expense of them—to what takes place in the Gas Committee of a Scottish Corporation. The price of gas for a year is fixed upon an estimate of what it will cost to produce it, and, in our particular case, realize a given profit. The principle is, however, the same, and is essentially a sound one.

We need hardly add an expression of regret at the rumoured action of the Chartered Company. When the comparative advantages of the sliding scale and the revision clauses first came up for discussion, we strongly advised the companies who possessed the latter to adhere to them. To-day we find ourselves compelled to advise the public to insist on their retention. They afford the best guarantee a company can possibly have for the realization of full statutory profits, which is all a company can want. At the same time, they offer to the public the means of controlling the price of gas, so that the profits which the wisdom of Parliament has hitherto allowed shall not be exceeded.

There never was, a Liveried Official assured us, such a scene at the Auction Mart as was presented on the occasion of the sale of the late Mr. Brushfield's gas property. The room in which the sale was held was crowded long before the hour announced for the commencement of the sale. It was with some difficulty that the auctioneer made his way into the room. The staircase and passage were crowded with anxious would-be investors, directors, managers, and secretaries, and we shall, perhaps, be not far wrong when we say that, the number who came and went, would have filled the room three times over.

And yet no sane individual could have gone to the Mart with the idea of making what is called a bargain. The value of gas property is so well known, and so thoroughly appreciated, that any one could tell to a few shillings what each individual lot would fetch. As it turned out, a trifle more than market prices were realized, and, in general terms, we may say that the lots were knocked down at a price which will yield but little over 4¾ per cent. A more detailed account of the prices fetched will be found in another column. We believe we are correct in stating that, something like two-thirds of the gas and water shares sold were bought for the Birkbeck Bank, a fact of which the Metropolitan Board of Works may take note, and which may be of significance to many. We have before expressed our satisfaction at seeing gas property passing into such hands, and shall forbear further comment.

On a hasty, but, we believe, pretty accurate calculation, we may say that the sum realized for the whole property was £45,000. The nominal value of the gas shares sold amounted to £16,741, and they realized £32,011. It is thus seen that a general premium of nearly 100 per cent. was obtained.

The space we are compelled to give to metropolitan gas affairs just now, prevents us from paying so much attention to provincial matters as we could desire. Some of them, however, must be shortly noticed. We are sorry to see that the concession made by the Swansea Gas Company does not satisfy the Corporation. We think the latter ought, without hesitation, to have accepted the proposals of the company, if only as a temporary measure. The saving to the town would be immediate and considerable; and, in the course of twelve months, the results to the company could be satisfactorily decided. On the other hand, it is quite clear that the quality of the gas supplied by the company is capable of improvement. That some will be made, we feel satisfied; but the company should lose no time in completing the alterations in the works, which will effect the desired end.

There seems to be a good opportunity for a professional gas agitator at Fleetwood. The gas supplied by the company there is excellent, as regards illuminating power, but it would seem to be submitted to no process of purification at all. It contains a large proportion of sulphuretted hydrogen, the presence of which, we take leave to say, is inexcusable. This state of things ought to be remedied at once. There is in the town, as a matter of course, tall talk about establishing a new company; but no one seems to apprehend the difficulties which lie in the way of the successful prosecution of such a design. The existing gas company have it in their power to put a speedy end to the present agitation, and we sincerely hope we shall hear nothing more of it.

We are glad to see that an arrangement has been come to between the Mersey Docks Board and the Liverpool Gas Company, under which the company will have to pay only two-thirds of the damage caused by the fire at the landing-stage, and the law costs of the Board. It will be remembered that a verdict was taken for £200,000; but the actual damages were to be settled by a referee, and we have a confident hope that they will be largely reduced. The probability, we understand, is, that the gas company will not have to pay more than £90,000. We may add, that, under the arrangement, the money will be paid by instalments.

The Commissioners of Llandudno are proposing to purchase from a private company the gas and water works supplying the town and district. Negotiations seem to have proceeded so far, that there may be time to obtain a special Act in the next session.

The Gas Commissioners and the inhabitants of Dundee are not altogether satisfied with the gas supplied. There are the usual contradictions about illuminating power; but we must accept the evidence of the photometer, and believe that the quality ranges from 26 to 28 candles. If, with gas of such quality, a deficiency of light is complained of, it is clear that the cause lies in the inappropriateness of the consumers fittings. The commissioners should look to these, and give their customers some proper advice.

Water and Sanitary Notes.

THERE is now a prospect that, say before many years are over, a combined system for the drainage of the Thames Valley will be in operation. What that system may be, it is, of course, impossible to say. The only project as yet announced is that of Sir Joseph Bazalgette, who proposes an intercepting sewer alongside the river, which is finally to join the West Kent Main Drainage Sewer, and discharge into the river some miles below the outfalls of the metropolitan sewers.

To say the truth, the opening of the inquiry commenced before Colonel Cox does not promise unanimity among the many local authorities, who will be affected by a combined scheme; and we very much question whether any scheme of the kind can ever be carried out, except under compulsion.

There is also the valley of the Lea, for which it is equally essential that a combined plan of drainage should be adopted. The Metropolitan Board of Works have recently asked the Local Board of West Ham to construct works at a cost of £84,000 for the admission of their sewage into the metropolitan outfall works. But the works proposed by the Board have been designed to receive the whole drainage of the valley of the Lea, and the West Ham Board very properly object to pay for works which would benefit many other authorities. There is here another case for the intervention of the Local Government Board.

The first proposal for the application of the Artizans Dwellings Act in the metropolis has given the Metropolitan Board a sort of fright, and no wonder. A prospect of unlimited taxation is opened up, from the infliction of which the Board naturally shrink. They are already sufficiently unpopular with ratepayers. To our minds, alterations made under the Act in question should be remunerative, or, at all events, self-supporting. If, however, new and wide streets are to be made in connexion with the sanitary improvements, it is certain that some of the cost must fall on rates.

It is somewhat amusing to notice a complaint, on the part of some members of the Board, that "Torrens's Act" has not been more strictly enforced. Of course, all the members know very well that, as a rule, bad property in a parish almost invariably belongs to vestrymen, or, if not, to those who have

strong influence in the vestry. No wonder, then, that medical officers—seldom too independent—never reported on the condition of tenements, an uncoloured description of which would not be received as truthful. The day has come, however, when the owners of such property can claim compensation for its demolition, and the collected vestrymen in Spring Gardens wince at the prospect. Are they really serious in the desire to obtain powers, enabling them to enforce the provisions of Torrens's Act? If so, we will engage that they may get them with ease next session, with much advantage to the poor and to ratepayers, but not to some vestrymen.

SALE OF METROPOLITAN, ETC., GAS AND WATER SHARES.

On Friday last, at the Auction Mart, Tokenhouse Yard, London, Messrs. Ventom, Bull, and Cooper offered for sale, by auction, the valuable stocks and shares in some of the leading gas and water companies belonging to the late Mr. Thomas Brushfield. The room in which the sale took place was crowded almost to suffocation during the two hours occupied by the proceedings, and the competition was very spirited throughout.

The following is a list of the shares offered and the prices realized. The shares were arranged for sale, as nearly as possible in £100 lots, and the stock was offered in single lots of £100 each:—

	Realized.
The Gaslight and Coke Company.	
194 A ordinary shares, £10 paid	£20 per share.
35 A 5 per cent. preference shares (3rd issue)	18¼ ,,
45 A 5 per cent. pref. shares (4th issue), £2 paid.	7 ,,
20 C 10 per cent. 2nd preference shares, £10 paid	22 ,,
Crystal Palace District Gas Company.	
10 fully paid (£10) 6 per cent. preference shares.	£16 per share.
20 fully paid (£10) original 10 per cent. shares	20 ,,
35 ordinary 7 per cent. ditto	15 ,,
5 converted 10 per cent. shares, and 4 ditto ditto, £2 per share paid	115 the lot.
5 converted 7 per cent., fully paid, £10 each, and 4 ditto ditto, £2 per share paid	90 ,,
Commercial Gas Company.	
£100 preference consolidated stock	£196 per £100.
£825 ditto ditto	197 ,,
£300 consolidated stock	197¼ ,,
£7800 ditto	197 ,,
£105½ ditto	203 the lot.
East London Water-Works.	
£400 stock	£145½ per £100.
£200 do.	146 ,,
£100 do.	146½ ,,
Kent Water-Works Company.	
£100 capital stock, ex div.	£155½ per £100.
£100 ditto	156 ,,
£100 ditto	156½ ,,
£100 ditto	157½ ,,
£100 ditto	158 ,,
4 £10 shares, £2 10s. paid up	36½ the lot.
Ratcliff Gas Company.	
5 £20 shares.	£41 per share.
22 ditto	40 ,,
Tottenham and Edmonton Gas Company.	
40 shares, £5 paid, ex. div.	£9⅜ per share.
150 ditto ditto	9½ ,,
10 ditto ditto	9⅝ ,,
20 ditto ditto	9½ ,,
15 ditto ditto	9¼ ,,
Lambeth Water-Works Company.	
21 £100 shares, fully paid	£145 per £100.
7 ditto	145½ ,,
4 half shares, of £50 each	145 ,,
2 ditto and 1 quarter share of £25	180 the lot.
4 £100 shares (45 per cent. deposit paid)	140 per £100.
2 ditto and 1 quarter share, ditto	162 the lot.
Regent's Canal Company.	
£500 consolidated (ordinary) stock, at per £100 stock, ex div.	£109
London Gaslight Company.	
£250 first preference 6 per cent. stock, at per £100 stock	£138
Surrey Consumers Gas Company.	
40 £10 shares, fully paid	£20 per share.
8 ditto	19 ,,
40 ditto £8 paid	17½ ,,
15 ditto	17 ,,
Woolwich Equitable Gas Company.	
10 £10 shares	20½ per share.
Independent Gas Company.	
35 new £'0 D shares, fully paid	£20¼ per share.
5 new £20 C shares, ,,	31 ,,
Chigwell, Loughton, and Woodford Gas Company.	
£400 stock	£100 per £100.
£150 do.	150 per £150.
28 £10 shares	10 per share.
London and Provincial Bank.	
14 £10 shares, £5 paid	£10½ per share.
The City Bank.	
108 £20 shares, £10 paid	£14 per share.
Central Bank of London.	
£525 £10 shares, £5 paid	£7¾ per share.

The total sales amounted to £45,100. The nominal value of the gas shares was £16,741, and they realized £82,011. The water shares were nominally of the value of £4630, and realized £6816.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

LXXII.

The accompanying engraving, fig. 1, represents a half section and elevation of the holder and tank, already referred to, constructed by Mr. F. J. Evans at the Horseferry Road station of the Chartered Gas Company. Fig. 2 shows a fourth of the plan of the same holder, part of which is covered with the sheets forming the roof, the box curb being extended throughout. The timber framing for the roof is also represented.

The tank, as will be observed, is only annular for a portion of its height, the other part projecting above the ground. We may assume that this plan was adopted by the engineer in consequence of the extremely porous nature of the site, and its proximity to the river Thames, which rendered an excavation of greater depth impracticable, or, at least, too costly as compared with its advantages. The diameter of the tank is 200 feet, and its depth 25 feet; it is partly constructed of cast and partly of wrought iron, the whole of the ground being left in the centre, and rendered impermeable by concrete, brick on edge, and plates as described.

The holder is telescopic, in two lifts, the outer of which is 200 feet in diameter and 25 feet 3 inches deep; the inner is 198 feet in diameter and 25 feet 9 inches deep, the capacity of the two holders being 1,500,000 cubic feet. The roof is perfectly flat, and entirely destitute of trussing, but is supported, when the holder is down, by a wooden framing, erected on posts of the same material, as represented in the drawing; the box curb, shown in section, with the adjoining strengthened sheets, serving to retain the vessel in its cylindrical form, a point of the greatest importance, in order to prevent the guide-rollers escaping from their respective guides. As both apparatus are remarkable specimens of engineering, we give the specifications of their construction, which, with the drawings, have been kindly placed at our disposal by Mr. Evans.

Specification of Work to be done for the Chartered Gas Company, Westminster Station, in the Erection of a Tank, 202 feet diameter and 25 feet deep.

Description of Work. The work consists in the excavation of certain earth, and the forming of a foundation for the erection of an iron tank.

Inspect Site. Parties desirous of tendering are invited to inspect the locality of the proposed tank, in order that they may form an opinion of the nature of the ground, and the facilities in carrying out the work.

Formation of Tank. The tank will be formed partly of wrought iron, and partly of cast iron, in the manner shown by the drawings.

Depth of Tank. The earth to be excavated in the form of an annulus, and it is expected a total depth of 15 feet will be required, so as to leave the depth of the tank 13 feet from the present surface of the ground.

Piers. Excavate the earth for the 28 brick piers, and also for the syphon well.

Surplus Earth. Remove all surplus earth from the ground; retaining, however, such as may be wanted for filling in as may be required by the company, and to be deposited where ordered.

Shoring Timber, Pumps, &c. Provide all timber necessary for shoring the earth effectually and properly; also find steam-engines, pumps, fuel, labour, tools, and every apparatus for properly drawing and discharging the water from the foundations, and from the premises of the company during the progress of the works, and to its entire completion, including also the time during which the tank and gasholder are being erected. Properly ram in all earth around the tank, and also on the inside ring, and wherever ordered by the engineer of the company, fill in with concrete.

Excavation of Tank. The excavation of the earth surrounding the tank to be made of as small a diameter as possible, consistent with allowing proper room for the erection of the tank.

Gravel Surface. The surface of the ground for 12 feet round the outside of the tank to be properly levelled after the same is completed, and to have a layer of gravel, 4 inches thick, laid over it.

Brickwork for Piers, &c. The brickwork for piers and syphon-well to be of the best hard-burnt grey stocks, and to be set in the best Portland cement, mixed in the proportion of one of cement and three of sharp coarse river sand, and all the bricks to be well wetted before being laid.

Concrete. The concrete to be formed of five parts of good clean gravel or ballast, free from loam, clay, or any other foreign matter, and one part of ground unslaked blue lias lime, and to be thrown down from a height of 10 feet.

Stone for Foundations. The stone for the foundations on which the tank plates will be laid to be Portland or Yorkshire, in pieces 6 feet wide, and as long as possible (not less than 5 feet), and 6 inches thick, the sides to be properly formed to the radius of the tank, and to be bedded perfectly level, and, where required, holes to be cut for the heads of the bolts to lay in.

Tunnel under Tank. Make the tunnel under the tank from the syphon-well in brickwork set in cement in the manner shown.

Granite Blocks. Provide and fix 28 granite blocks 5 feet 3 inches by 5 feet 3 inches by 2 feet thick, properly worked on the face, and with 4 holes cut in each block for the holding-down bolts for the columns to pass through; also one block of granite 6 feet by 6 feet by 2 feet (for centre column of gasholder), fixed on the brick pier in the centre of tank. The upper face of this block need only be worked smooth. The brick pier to be set in cement, and to be of the dimensions shown. Also provide and fix York flaggings under the inlet and outlet pipes in the manner represented.

Schedule of Prices. As it will in some measure depend upon the nature of the ground whether the exact quantities of earthwork, brickwork, and concrete shown by the drawings will be carried out, it is requested the parties tendering will give a schedule of prices for the following work, viz.:—

Earthwork	at per yard
Concrete	,, ,,
Brickwork in cement	,, rod.

These prices to include all other work that may be required to be done in connexion with this contract.

Power to retain Gravel, Sand, &c. The company to have the power of retaining all earth, gravel, or sand that may be excavated, and that may not be required for any part of the work; but the contractor is at liberty to use such sand or gravel for making the cement or concrete, if the same is approved of by the engineer of the company.

Holding-down Bolts. In each of the 28 piers fix a cast-iron plate 5 feet square by 2 inches thick, with 4 holding-down bolts, 10 feet long by 2½ inches square, of the best SC-iron, the bottom end to have a key-way forged with wrought-iron cotter, and the top to be screwed and provided with a suitable nut for screwing down the column.

Ironwork of Tank. The ironwork of the tank to be formed in the manner shown on the drawing, and to consist first, as regards the outer circumference, of plates of wrought iron rivetted together, the sides to be 25 feet deep, and the diameter of tank 202 feet. The bottom or first tier to be ⅜ of an inch thick; the next, or long tier, to be 11-16ths, the next tier 11-16ths, the remaining plates ½ thick; the lap of the plates to be 3 inches, and the rivets to be ⅞ in diameter, and not to be more than 2½ inches apart from centre to centre. On the top and bottom tier of plates rivet a piece of 4½ inch by 4½ inch by ⅝ inch angle iron.

Ribs of Wrought Iron on Sides. Provide and fix 28 ribs of wrought iron, ⅝ thick and 12 inches wide in the manner shown on the drawing between each column.

Guides of Cast Iron. Provide and fix 28 guides of cast iron to be securely bolted to the side of tank, opposite each column, for the purpose of allowing the rollers fixed on the bottom of outside gasholder to work in. These guides to be 9 inches wide and 2 inches deep.

Bottom of Tank. The bottom of tank to consist of 140 plates, 5 feet 9 inches wide and 1¼ inch thick, made of cast iron, the flanges to be 1 inch thick and 3 inches wide, with a bracket ⅜ inch thick, cast between each bolt-hole; the bolts to be ¾ inch diameter at the screwed end; the head of the bolts uniting the side of tank to be formed taper, so as to fit in the countersunk hole in the bottom plate.

Side of Tank. The side forming the internal part of annulus to be of wrought iron, 12 feet deep, and to be made in three tiers of plates, the bottom tier to be ¾ inch thick, and the other two ⅝; the rivets, &c., to be the same as for the side plates of outer annulus. Provide and fix 4½ by 4½ by ⅝ angle iron on the top and bottom tier of plates.

Ribs of Wrought Iron. Provide and fix 28 ribs of wrought iron, ⅝ thick and 12 inches wide, to the side of tank in the manner shown, to be rivetted to 4½ by 4½ by ⅝ angle iron. The joints between the wrought and cast iron to be made with the best iron cement, and the whole of the work to be quite water-tight.

Sheet-Iron Covering over Tank. After the inside ring has been fixed, and the whole of the ground properly levelled and filled up level with concrete, 1 foot 6 inches thick, the surface is to be covered with one course of stock bricks, set on edge in cement, and on this sheet-iron plates, 3-16ths thick, properly rivetted together, and made perfectly water-tight, and secured to the top flange of inside ring of side plates by ⅝ inch bolts and nuts, the joints being made with red and white lead of a proper consistence.

Cast-Iron Rings. Provide and fix two cast-iron rings, through which the 24-inch inlet and outlet pipes pass, the same to be secured in the manner shown.

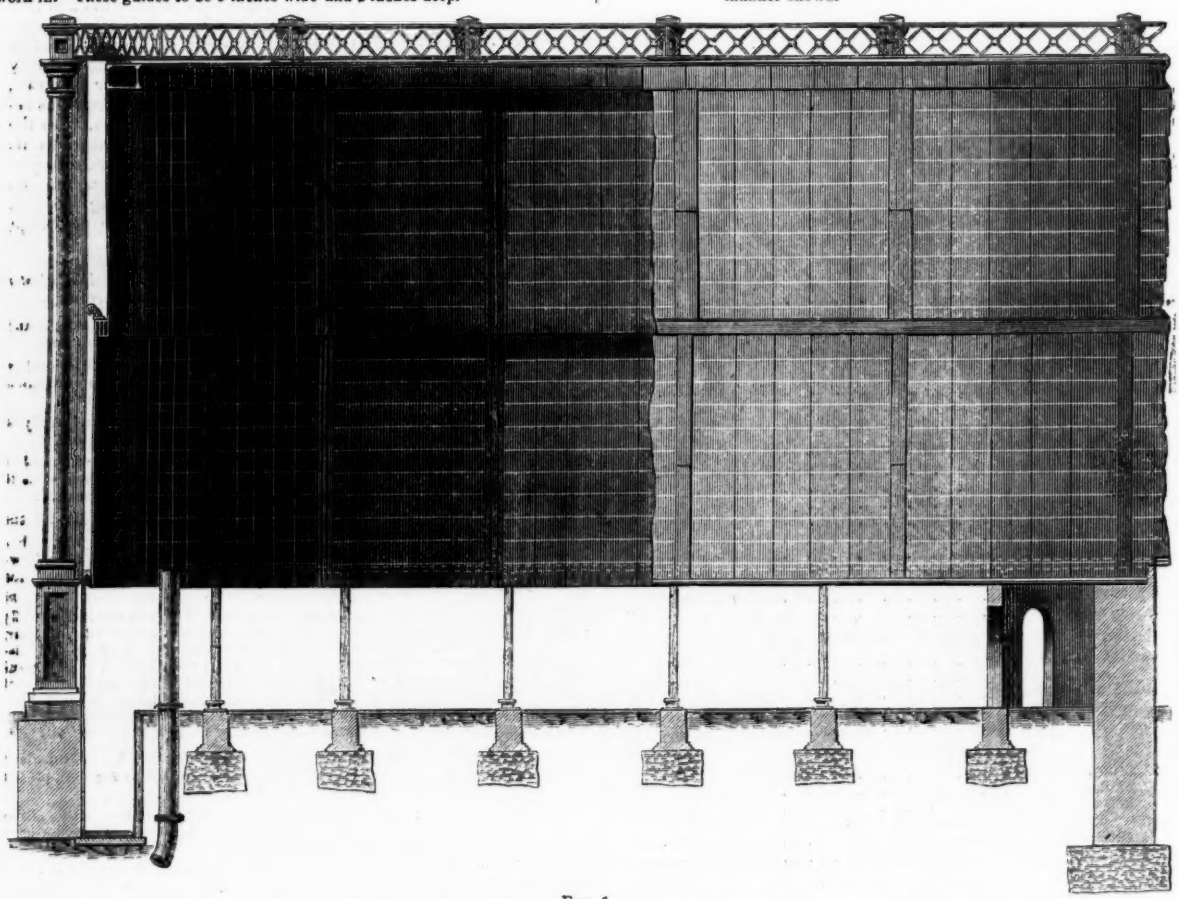


Fig. 1.

Inlet and Outlet Pipes. Provide and fix the necessary quantity of 24-inch inlet and outlet pipes, with syphons, bends, branches, bolts and nuts, &c., in the manner shown.

Paint. The whole of the wrought iron to have a coat of paint before leaving the contractors works, and to have another coat as soon as it is fixed.

Wrought-Iron Plates. The wrought-iron plates to be of the best description, and free from defects. All such as are imperfectly made, or are in any way defective, will be rejected. The plates to be guaranteed to sustain a tensile strength of 20 tons per square inch of sectional area.

Testing. And the company to have the power of testing any of the plates in the manner now generally adopted, the expense of such test to be borne by the contractor in the event of the plates proving deficient in strength, and to provide others of the proper strength. Should the plates prove of the proper standard, the expense of the process of proving, and the replacing other plates, to be borne by the company.

Cast Iron. The cast iron forming the bottom to be made of the best Staffordshire iron of second running, free from sand or air holes. All defective plates, as well as those that are not of the specified thickness, will be rejected.

Specification for the Supplying and Erection of a Double Gasholder for the Chartered Gas Company, Westminster Station.

Outside Gasholder.

The outside gasholder to be 200 feet in diameter, by 25 feet 3 inches in depth.

Grip of Gasholder. The grip to be formed of double angle iron 8 inches wide by 3 inches deep, rolled in one piece and ⅝ inch thick, the sides to ⅜ inch thick and 15 inches deep, round the outer edge a piece of 1½-inch half-round iron to be rivetted.

Curb of Outside Gasholder. The curb on bottom of gasholder to be formed in the manner shown, by two pieces of 4½-inch by 4½-inch angle iron, rivetted to sides of gasholder with two pieces of 8-inch by ⅜-inch flat iron, rivetted together as shown. Provide and fix 28 rollers of cast iron on this curb, to work in the cast-iron guide fixed on side of tank, 7 inches diameter by 8 inches wide.

Sides of Outer Gasholder. The sides of gasholder to be formed by 28 pieces of flat iron ⅜ inch thick and 15 inches wide, on each of which is to be rivetted two pieces of T-iron 3½ inch by 3 inch by ½ inch.

First row of Side Plates. The first row of side plate fixed on the grip to be 3-16ths inch thick.

First row of Bottom Plates. The first row of bottom plates to be 1 1/16 inch thick, and the next row 3-16ths inch, the rest of the plates forming the sides to be ¼ inch thick, and to be as near 4 feet 3 inches by 2 feet 3 inches as possible.

Guide Rollers to be fixed on Grip. On the grip are to be fixed 28 flanch rollers 15 inches diameter, with suitable cast-iron frames to work against the guides fixed against the columns.

Inside Gasholder.

The inside gasholder to be 198 feet diameter by 25 feet 9 inches deep.

Curb. The curb to be formed in the manner shown by drawing, and to consist of a box girder constructed of wrought-iron plates ⅜ inch thick, rivetted together by means of 4-½ inch by 4½-inch by ½-inch angle iron, and to be 3 feet long by 2 feet deep, inside measurement.

Centre Plate. The centre plate to be ¾ inch thick, the second ½ inch, and the third ⅝ inch.

Wrought Iron Strips. Provide and fix 28 strips of flat iron 2 feet 6 inches wide by ⅜ inch thick, radiating from centre to sides of curb, where they are to be rivetted.

Thickness of Plates of Top. The first row of plates forming top, and fixed to the top plate of curb, to be ½ inch thick, the second row to be ½ inch thick, and the remaining portion of the top to be ⅜ inch thick.

The sides of gasholder to be formed by means of a flat piece of iron 2 feet wide by ½ inch thick, on which is rivetted two pieces of angle iron 4 inches by 4 inches by ½ inch, and to these a semi-tube of iron ½ inch thick; this tube to be 12 inches wide by 12 inches deep, and is to be secured to the top curb by means of angle iron in the manner shown.

Struts. Provide and fix 28 pieces of 4-inch by 4-inch by ½-inch T-iron, one end to be rivetted to the curb and the other end to the semi-tube, forming a strut about 4 feet 6 inches long.

Cup. The cup on the bottom of gasholder to be formed in all respects in the same manner as the grip for the outer gasholder.

First row of Sides Plates. The first row of plates forming the sides from the curb downwards to be 3-16ths inch thick.

First row of Bottom Plates. The first row of plates upwards from cup to be 3-16ths inch thick, the remaining portion of the side plates to be ¼ inch thick, and of the same size as those for the outer gasholder.

Guide Rollers. Provide and fix 28 rollers 2 feet diameter with flanges, the frames to be made of wrought-iron similar in all respects to a pattern to be seen at the company's works; these rollers to work against the guides fixed against the columns.

Ironwork of best quality. The whole of the iron to be of the very best description suitable for this sort of work, and to have a coat of paint before leaving the contractors premises.

Size of Rivets. The size and distance apart of the different sorts of rivets, suitable for the different thicknesses of plates to be left to the discretion of the contractor, as well as the method of making the joinings of the several parts of the ironwork; it being, however, understood that should the engineer to the company object to the mode of carrying out any of the details, the contractor is bound to alter the same to the satisfaction of the engineer on his making a formal complaint in writing.

No alteration in thickness of Plates. No alteration whatever will be allowed, however, in the thickness of the several plates without express authority in writing by the engineer to the company.

Timber Framework for Supporting Roof of Gasholder when down.

Framework. The framework to be formed of the best Memel timber in the manner shown on the drawing.

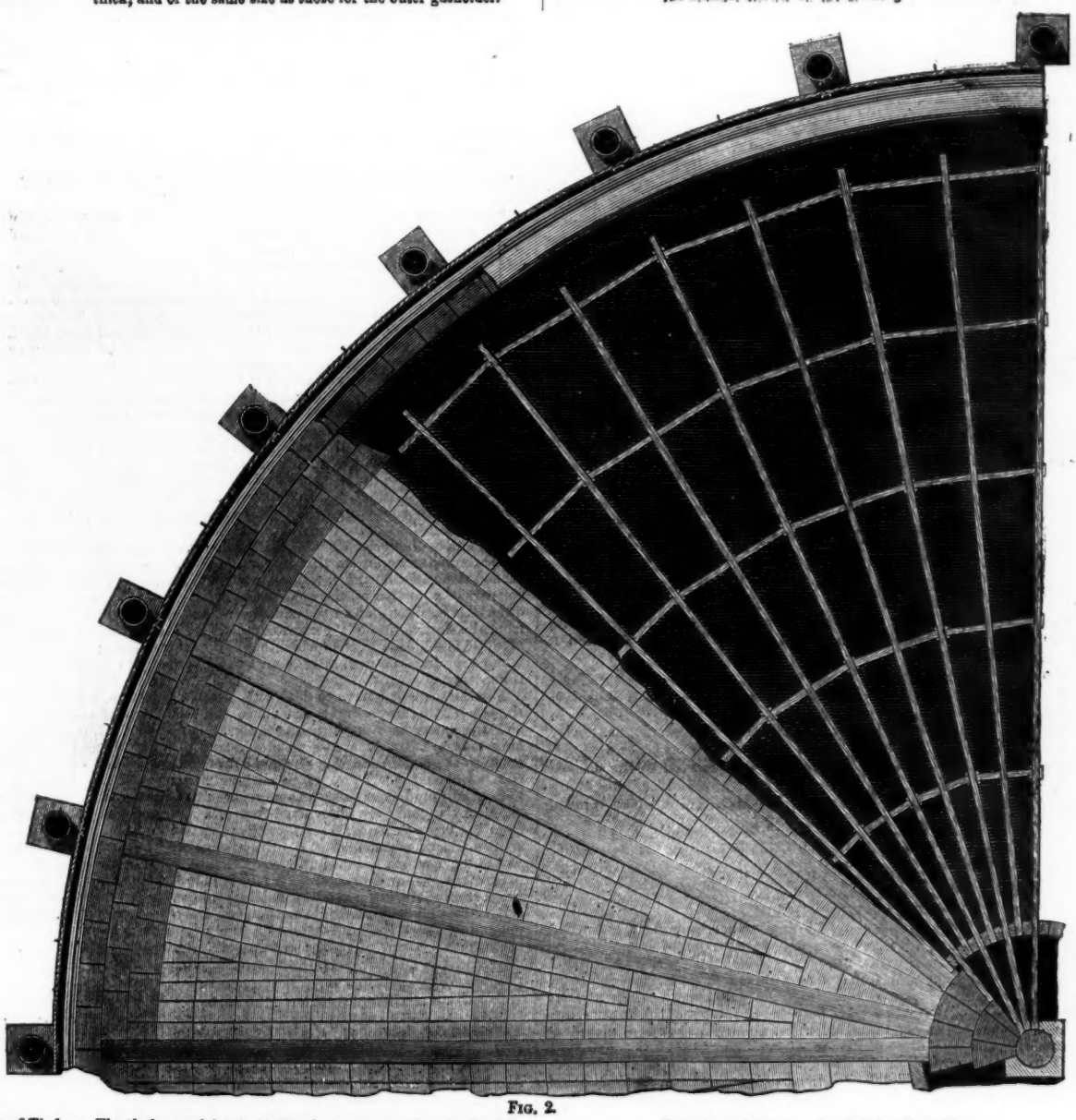


FIG. 2.

Size of Timbers for Framing. The timber uprights to be 9 inches square, and to be fixed in cast-iron sockets secured to the wrought iron forming the bottom of tank, by means of four ⅞ inch bolts, and nuts properly secured and made water-tight. The rest of the timber work to be properly scarfed, and framed, and to be formed of 12-inch by 6-inch timber, sound, and free from knots. The brickwork for the piers and for the centre piers will be done by the company, but the fixing of the cast-iron sockets to be done by the contractor.

Company to fill Tank with Water. The company will fill the tank with water in the first instance, but should it be necessary from any cause connected with the gasholder to empty it, the expense of so doing, and refilling the same, to be borne by the contractor, and the amount will be deducted from any sums due to him by the company.

Gasholders to be filled with Air. The contractor is also required to fill the gasholders with air, by means of a steam-engine and blowing apparatus, to see if it works properly, and is at the same time perfectly sound, which will be ascertained by allowing the gasholder to stand for some days full of air, and if found quite sound and tight it will then be filled with gas, and a similar process adopted; should, however, it not be found tight, the contractor must take steps to make it so.

Ironwork to be Painted. The whole of the ironwork of gasholder to be painted by the contractor, after the same has been fixed, and its soundness approved of by the engineer.

Framing and Columns for Guiding Gasholder.

Columns for Guiding Gasholder. The columns to be 28 in number. The base of pedestal of column to be 5 feet square, and to be formed of plates 1¼ thick, bolted together. The column to be 50 feet long, 3 feet diameter at base, by 1¼ thick, and 2 feet 4 inches at top by 1 inch thick. On top of column fix a square cap, as shown in drawing; the column to be cast in four pieces, and the face of the joints to be turned, to be bolted together in the manner shown by eight 1-inch bolts and nuts. Provide and fix a cast-iron guide against each column in the manner shown.

Wrought-Iron Girder.

Wrought-Iron Girder. The girders connecting columns together to be of wrought iron formed by two pieces, 4½ inches by 4½ inches by ½-inch angle iron at top and bottom, with a flat plate 10 inches wide and ½ inch thick, rivetted on. The angle iron at top and bottom to be connected by a trellis-work formed of bars of flat iron, 4 inches by 4 inches by ½ inch, as shown on drawing; these girders to be connected together at the ends, and also to be bolted to the top of column by four ⅞-inch bolts and nuts, a cast-iron ornament to be bolted to the centre of each side of trellis.

The whole of the work to be completed to the true intent and meaning of the drawings and specification, and the gasholders to be in every respect of the proper diameter, and forming a true circle, and to be quite gas-tight.

The general conditions referring to the quality of materials, responsibility of contractors, privilege of engineer to interfere during the progress of the work, the mode of payment, &c., are omitted, as these have already been detailed when referring to other specifications by various engineers.

The engraving, fig. 3, shows the method of constructing a similar tank, carried into execution by Messrs. Piggott and Co., of Birmingham, in 1865, at the works of the Surrey Consumers Company at Rotherhithe, and which may be briefly described as follows:—

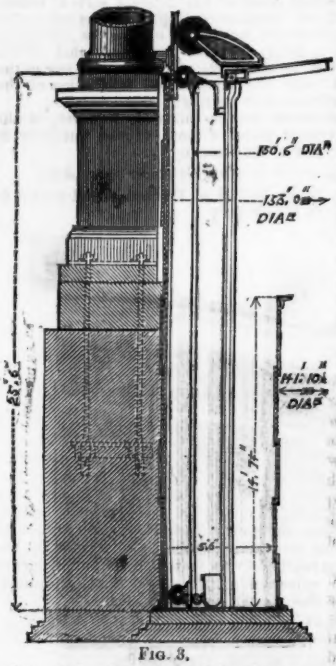


FIG. 3.

The tank is entirely of wrought iron, 153 feet in diameter, the outer ring of plates being 25 feet 6 inches, and the inner ring 15 feet 6 inches deep, leaving a clear space between them of 5 feet 6 inches, the width of the annulus.

The outer circle of plates is in eight tiers of unequal depth, as shown, the horizontal joints being lapped with single rows of rivets, and the outer joints butted with covering strips and double rows of rivets. The plates of the inner ring are arranged in a similar manner.

The plates forming the bottom of the tank are $\frac{3}{4}$ of an inch thick, joined to the sides by two curbs of angle-iron, each 5 inches by 5 inches by $\frac{3}{4}$ inch, the joints of the plates being butted, and having covering strips 8 inch by $\frac{3}{4}$ inch, and double rows of $\frac{7}{8}$-inch rivets.

The width and thickness of the side plates are as follow:—

The 1st or bottom tier,	2	feet	4	inches	wide and	$\frac{3}{4}$	inch thick.
„ 2nd or next	„	2	„	6	„	„	$\frac{11}{16}$ „
„ 3rd „	„	2	„	9	„	„	$\frac{11}{16}$ „
„ 4th „	„	3	„	3	„	„	$\frac{11}{16}$ „
„ 5th „	„	3	„	6	„	„	$\frac{9}{16}$ „
„ 6th, 7th, & 8th	„	3	„	8	„	„	$\frac{1}{2}$ „

The two bottom tiers are rivetted in the vertical seams with $\frac{7}{8}$-inch rivets, and in all the other joints with $\frac{3}{4}$-inch rivets.

Around the top edge a light trough-iron curb is fixed with rivets 12 inches apart, and round the top of the inner sides is rivetted a curb of 4-inch by 4-inch by $\frac{1}{2}$-inch angle iron.

The tank, as fixed, stands 10 feet out of the ground, and with its inlet and outlet pipes complete weighs about 400 tons, and cost £9200.

This holder, like that already described, is telescopic, as partly shown in section. The seal-cup and grip differ from those as generally constructed, by being made of iron plate curved to the desired form, which system is also adopted in the new holder now being constructed by the same firm at the South Metropolitan Gas-Works.

(To be continued.)

Correspondence.

GAS-EXHAUSTERS.

SIR,—Although I will not go so far as your correspondent, "An Old Gas Engineer," who says that "in a few years a jet of steam will be the only method of exhaustion used in gas-works;" yet, from what I see and hear, I must admit that my scepticism is rather toning down. The fact is, the plan looks so beautifully unique, except to the present exhauster makers, that one cannot help being interested in its progress, especially when it is known to the older ones among us that its success will remove or cause the discontinuance of machinery that has added very much to the complication of gas-works, and to the anxiety of the managers. From the Continent, where upwards of 150 exhausters of this kind are at work, no information has reached us, except that there "they are placed on the gasholder side of the scrubber, the steam condensed anyhow, and the water run to waste." This, Mr. Cleland very properly observes, "is a considerable waste of force," and one might almost add, as well as a slovenly mode of working. The using of such water over and over in the steam-boilers, as suggested by your correspondent, would be no improvement; it would simply produce a "primary" compound, equalled only by the "water" from an old gasholder-tank. Besides, why should the water run to waste? or why wish to return it to the boilers?

Mr. Cleland tells us that experiments carefully made at his own works proved that the scrubbers were producing liquor from 12 to 16 ounces strength, and all the ammonia, save a trace, removed. In this case the steam-j t was introduced at the outlet of the condensers. Now, we know that the quantity of ammonia left in the gas after proper condensation requires about one gallon, or 10 pounds, of water per 1000 cubic feet for its removal, when taken out by the ordinary water scrubber, producing a liquor a little over the strength quoted in Mr. Cleland's reply to Mr. George Anderson in your JOURNAL for Oct. 26. This leads me to infer that, during the experiment at Linacre in April last, the quantity of water evaporated was a little over 10 lbs. per 1000 cubic feet of gas passed through the exhauster.

In conclusion, I would remark that my "pale ghost" is not impoverished gas; I have been led to know that it is easier to *dash* the lighting power out of the gas with cold water than to reduce it by the heat of a powerful jet of steam. No; I rather want to be convinced that we shall not require an overgrown condensing apparatus to bring the gas back again to a temperature that will allow of its introduction to the complex sulphur-purifying arrangements now required. No doubt, the trial of the Cleland exhauster at Silvertown will be so conducted as to answer all questions relating to such points as were mentioned by Mr. Anderson; if not, any attempt to compare this mode of exhaustion with the better class of exhauster engines of the present day would be a waste of time, and a neglect of important detail.

W. MANN.

London, Oct. 29, 1875.*

* [Received too late for insertion last week.—ED. J. G. L.]

SIR,—Mr. Conrad Voss, in his justification of the use of the term "exhauster," in preference to "propeller," has recourse to etymology—a useful aid in fixing the meaning and use of a word, provided the etymology be correct. That of Mr. Voss, however, does not, as regards the word under consideration, fulfil this condition. The word "exhauster," instead of being derived from the Latin *exhalere*, to exhale, or breathe out, as Mr. Voss says, is clearly derived from *ex* and *haurio*, to draw out, to exhaust. And this, to my mind, so far as a layman, who merely takes an interest in, but is not professionally engaged in gas engineering, may speak on such a subject, indicates better the nature and action of the machinery of the exhauster than any word derived from *exhalere* would do.

H. de la H.

Nov. 3, 1875.

"EXHAUSTERS" OR "PROPELLERS?"—AND WHAT IS "PERMANENT GAS?"

SIR,—I must give a double heading to this letter, because I wish to reply to two very different matters, as contained in the letters of Mr. Voss and of "Nemo," in this week's number of your JOURNAL.

I am quite willing to take a lesson in Latin from Mr. Voss, if he will only give it correctly—although, as he "joins completely" in my opinions as to the real action and proper employment of the so-called "Exhausters," it is not of much importance to correct his mistake in etymology. Even were the word "exhausters" derived from the Latin verb *exhalere*, to "breathe out," surely it need not be told to any gas maker that the gas is perfectly capable of "breathing itself out" of the retorts as fast as it is generated, if it be left free to do so; and hence I repeat my former statement that the proper function of the exhausters is to give *new* force to the gas as it issues from the retorts, in order to "propel" it through the mass of purifying materials, and into the gasholders. But the word "exhausters" is *not* derived from the verb *exhalere*, but from *exhaustus*, the participle of an entirely different Latin verb, meaning "to drain, or pump out;" while our word "exhaustion" is simply the Latin word *exhaustio*, both the English and the Latin form of the word having exactly the same meaning—viz., "draining or pumping out."

Next as to the letter of "Nemo." He challenges the correctness of my statement or opinion, that by far the larger per centage of the solid carbon deposited on the interior surface of retorts is formed from, and consists of a portion of, the readily condensing tar-vapours, which would otherwise be deposited in the condensers, and only a trifling per centage from the destruction of "permanent gas." I am aware that this opinion of mine is opposed to that which has hitherto prevailed; but I think it looks very like common sense, and I shall be ready to support it further if necessary.

For the present I have to deal with Nemo's objection, which he states thus:—"The tarry vapours enter into the formation of permanent gas, and the latter is constituted entirely of the former. Under these circumstances I am at a loss to understand how our friend [myself] can come to the conclusion that the deposit of carbon is not obtained from the permanent gas." A more curious *non sequitur* in reasoning can hardly be found than this. As a question of logic he might as well say: The tarry vapours are all evolved from the coal, and the permanent gas from the tarry vapours; therefore the coke residuum of the coal represents a loss of permanent gas. Every one sees that such an argument would be absurd, because the coke cannot possibly be converted into permanent gas, or gas of any kind. But it is also true that the large proportion of the tarry vapours which are deposited as tar in the condensers cannot be converted into permanent gas; and, therefore, whatever portion of these readily condensing tarry vapours may be deposited in the retorts instead of in the condensers, this result (although very inconvenient in other respects) can occasion no loss in the production of permanent gas.

"What is Permanent Gas?" is a question which, although not yet clearly determined, is of no small practical importance to gas makers. The general opinion has been that gas (meaning thereby permanent gas, or gas as supplied to the public) consists of particles of carbon mechanically suspended in hydrogen, and I believe that it is this view of the matter that has led to the numerous attempts to produce permanent gas from tar and other highly carbonaceous substances, of which attempts, that of the "Patent Gas Company" was the last, the most resolute, and, on the whole (abortive as it was), the most nearly successful. I venture to hold, however, that this view of the matter is fundamentally wrong, and that permanent gas consists of atoms of carbon, not merely suspended in, but *chemically united with*, hydrogen, forming molecules (so to call them), in some of which the *proportions* of carbon and hydrogen vary considerably, but all of which exist in a more or less stable condition of chemical union. According to the old opinion, permanent gas could be produced by merely infusing or dissolving (so to speak) carbon in hydrogen; but if the opinion which I have expressed be the right one, it follows that there can be no hope of producing permanent gas, unless from such portions of the carbon and hydrogen which *chemically unite during the process of distillation*, that the tary vapours which are deposited in the condensers (or by far the greater part of them) consist of carbon which has *not* been chemically united with hydrogen during the distillation, and that the best temperature and other conditions of carbonizing (which seem to me not yet accurately determined) are those which not merely get all the gaseous elements from the coal, but which will produce the *chemical union* of the carbon and hydrogen in the highest degree.

R. H. PATTERSON.

21, *John Street, Adelphi, Nov.* 5, 1875.

UNTRUSSED GASHOLDERS.

SIR,—Since gasholders have been made so large as they now are, of 150 to 200 feet in diameter, the advocates of trussed roofs have been driven to their wits end. They cannot construct a system of trussing that will bear its own weight. The more inveterate sticklers for trussed roofs are now compelled to construct a pier in the centre of the tank, on which to give the trussing a rest; and several large gasholders have of late been so set on a central crutch, to support the many tons of useless material which, like the web of a gigantic spider, radiates from the centre to the circumference.

Darwin, I believe, writes of man as an improved monkey. Had he graduated in some of our old-fashioned gas-works, he would have written of him, not as an improved monkey, but as a degenerate spider, for the spider is decidedly the better constructor of the two. He never requires a crutch to support his web, neither is he afraid of a flattish crown; but gracefully stretches the radial bars of his crown sheeting from bough to bough, and not unfrequently constructs a pocket for himself near the centre, and swings there comfortably without central support.

The notion that crowns need not be trussed is gaining ground, and Mr. Livesey tells us how he has constructed one of 180 feet in diameter, saving 100 tons of iron, and 2 inches of pressure! Well done! What will old-fogey-enlarged-iron-umbrella-like-crowned-gasholder-engineers say to that? Why, they will say, "Ah, it's all very well, but wait till the sheeting gets thin—what will happen then?" Ah, what will happen?

I had this question put to me, about 15 years ago, by one of our then most practical gas engineers. I was showing him the untrussed gasholders of the Great Central works, built about 10 years before. Well, we have waited now about a quarter of a century (they were built in 1850), and the catastrophe has not happened yet. "But, if it did happen," I said, "what then?" If a sheet became too thin to resist the pressure it had to bear, the gas would come out, and that sheet, and as many sheets as were like it, would have to be replaced by new ones; but that is not a novel thing to occur to the roof sheeting of a gasholder, for I have seen new sheeting put to several trussed crowns.

But I have seen and heard that there is a belief abroad that if you do not put in internal trussing, you throw a great deal more work upon the crown sheets, and therefore it is that they will wear out faster. This is a mere assertion—an unproved and unprovable assertion—and I will now proceed to show the converse—namely, that from having less to do they must last longer.

There was a time when the sheeting was rivetted to the trussing—that was sensible from a trussed point of view—just as the slating of a house is nailed to the trussing that supports it; but numerous leaks and small hollows in the sheets soon began to appear round the rivet heads, which at first were puttied up by those who were curious enough to go on top of their gasholders, and so the defect was made good for a time; but these little hollows in the sheets round the rivet heads held about a quarter of a thimble full of rain, and facilitated the act of oxidation, and by-and-by the leak got bigger and bigger round the rivet heads, till the hole in the sheet got big enough to let the rivet head pass through, when a patch could be put on, and the damaged sheet was whole again. Subsequently, the more intelligent gasholder builders took to merely laying the sheeting on the trussing, attaching it all round at the outside and to the central plate, from which was suspended the central king post of the trussing.

I once had the privilege of spending several hours in the interior of a gasholder about 150 feet in diameter, which was about to be inflated with air, and had a grand internal trussing. Before the inflation began the sheeting was lying quietly on the trussing; gradually, as the inflation proceeded, the sheeting rose off the framing until, half way between the centre and the outside (the fixed point) it had risen off the framing 4 inches. I afterwards had the opportunity of standing on the crown of this gasholder while it was inflated, and I saw a hollow in its centre of at least 12 feet in diameter, and several inches deep in the centre, where every shower would form a small lake; in fact, *the sheeting was supporting the trussing*, and the trussing was so heavy that it pulled down the sheeting in the centre, as I have described; consequently, the crown sheeting was not only supporting the gasholder as a non-trussed vessel, but, in addition, some hundred tons, more or less, of metal which was attached to its lower side.

The above is only one example of what I have often seen—indeed, I have never seen a trussed crown *where the sheets are attached to it at the centre*, but I have seen a hollow on the top of the crown at that part; and I will go so far as to assert that there is not a gasholder, over 100 feet in diameter, constructed as I have described, but has a hollow in the centre of the crown, more or less, but in every case sufficient to contain water; and if any trussed crown advocate can show a crown without such hollow, he has only to do so, and disprove my assertion.

Now I do not require to adduce further example to prove that, the sheeting has not only to lift the gasholder, but the trussing in addition; therefore it has more to do, more pressure to bear, and being worked harder must last shorter.

It has been argued that the trussing is of service to maintain the vessel in a circular form—that, radiating from the circumference to the centre, it prevents the outer rim from collapsing. This may be called the cart-wheel argument, for without spokes a wheel would be in a bad way. But is the trussing necessary? I think not, not if the outer rim and the first rows of top and side sheets are made stronger than those that follow. And let me add, such is advisable in all cases, as the angle iron that forms the outer rim is so very much thicker and stronger than the sheeting. For the same reason it is given on very ancient authority that it is not well to mend an old garment with new cloth.

However, the analogy between a spoked wheel and a gasholder does not apply. For a wheel, as it revolves, throws the whole weight on one spot, whereas the gasholder is kept circular by the whole of the guiding rollers that are equally distributed around its circumference, and held in their places by the guiding standards.

What is needed, therefore, is that the outer top kerb should be made strong enough to bear the greatest thrust that can be brought against it by a hurricane. Trussing, no doubt, will assist it, but it is an unwise and unengineering mode of applying the material.

There is no doubt but that Mr. Livesey, in discarding trussing in the roof of his gasholder, has done the right thing. He has got a gasholder whose centre of gravity is perhaps 30 feet lower than it would have been if roof-trussed; and, therefore, like a ship with its cargo in the hold, is not so likely to topple over as a vessel with a deck load.

The whole of the strains on the top carriages in a storm, when these sometimes smash, is also much reduced; and the weight being distributed evenly, he is certain to have a holder that will rise and fall level, and not uncup at an improper time, as many trussed holders have done.

Although telescopic gasholders are known to be much cheaper than single lifts, some of the greatest *savans* in the gas engineering world still build single lifts, for no other reason, that I ever heard, than that they are safer—*i.e.*, not so likely to upset; but, in answer to that, I reply that I have never had an accident with a gasholder, never had one uncup when it should not, and for 25 years I have either been secondarily or primarily responsible for their construction. They are of all sizes, from 30 to 150 feet in diameter, without a trussed crown in the lot.

Mr. Livesey has gone beyond, with one of 180 feet. His example will be contagious. The time is arriving when gas directors will not, and, if they would, gas consumers will not, allow the equivalent of from 500 to 1000 sovereigns to be for ever dangling inside each of their gasholders, earning no dividend, but uselessly adding to the capital account, and threatening the destruction of the structure from which they are suspended.

A few years ago I stood alone in the advocacy of untrussed gasholders. Two years ago the engineer of the Phœnix came over; now the engineer of the South Metropolitan has. The best men are always in the front; the others will allow us to note their relative merits as they arrive, and I trust we may soon be in the majority.

4, *Cannon Row, S.W.* GEORGE ANDERSON.

FREEZING OF GASHOLDER LUTES.

SIR,—Your able writer, in his "Treatise on the Science and Practice of the Manufacture and Distribution of Coal Gas," in the last JOURNAL, says that he has never heard of the lute of a telescope gasholder freezing in England. I can give him an instance of such at these works last winter, which caused the breaking of four out of seven of the swan-neck wheel-carriages; and, by so doing, we had to work our only holder, 50 feet by 20 feet, with only three top guides instead of seven, much to our inconvenience, necessitating continual watching. Although the ice was continually broken, I presume it was frozen in the inner part of the lute, and thereby did the mischief named. We have, therefore, practical knowledge, instead of theoretical, on the subject.

Gas-Works, Andover, Nov. 5, 1875. HY. WIMHURST.

STATION-METERS WITHOUT CASES.

SIR,—Mr. Hartley, who, in his letter this week, states that he is out in the country, appears to me to be also very much out at sea with regard to the working of my meter without a case, and I cannot help thinking that it would have been far wiser on his part to have waited patiently until he was in a position to give "demonstrative facts and reasonings," before condemning that with which he is insufficiently acquainted. What he states in reference to the attainment of better results, by dispensing with the drum also, may be very funny; but it has no connexion whatever with the subject, so I will not say anything more about it; but the weight of water contained in the drum *does* bear upon the subject, and, in Mr. Hartley's opinion, it bears so hard as to prevent the drum working. The only answer I can make to that objection is, that it does *not* prevent the drum working, and, as I stated in my last letter, a pressure of 1 inch is quite sufficient to drive it. As I am in a position to practically demonstrate that fact, I think I have the best of the argument, and most certainly have the advantage in "demonstrative facts."

Mr. Hartley is quite right in supposing that I have given no consideration to the behaviour of the water within the chambers of the drum. I have not, and for this reason—that, as the quantity of gas passed is correctly registered, and that being all I require, I do not trouble myself with circumstances that do not affect it.

It appears from the letter of Messrs. Warner and Cowan, that the point they are contending for is the necessity for the upper portion of the case to secure correct measurement when the lower half is used; but, as I propose to do away with the lower half, the question assumes a different aspect, and as I have constructed a meter to work satisfactorily, and to register correctly, without either the top or bottom of the case, it will, as you may imagine, require very strong arguments to convince me that the thing is impossible.

Nov. 4, 1875. J. T.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

COURT OF COMMON COUNCIL.

At the Meeting of the Court on Thursday last—the LORD MAYOR presiding. The report of the Gas and Water Committee, presented on the 30th of September, and which was published in the JOURNAL of the 12th ult., came on for consideration.

Mr. SHAW, chairman of the committee, moved the adoption of the report. In doing so, he said he thought he might congratulate the Court upon the measure of success that had attended their efforts this year to improve the conditions upon which gas had hitherto been supplied to the City and to the Metropolis at large. They had had to encounter a most vigorous opposition on the part of great and wealthy companies, who were naturally reluctant to part with a monopoly they had so long enjoyed, and which they had worked so entirely to their own profit. The Court would remember the serious misgivings, on the part of some officers and members of their own body, with which they engaged in the conflict; and it was a matter of great thankfulness to himself and their Gas Committee that these misgivings had proved groundless, and that the success they had attained amply justified the decision of the Court a year ago. It was only from the want of time, and the pressure of Government business, that their "Regulation Bill" did not pass in the recent session of Parliament; but the whole question had been thoroughly investigated before a select committee of the highest authority, whose decision had been accepted by the Government, so that next year their bill would proceed without the ordinary delays, and with hardly any cost. That committee carefully and minutely investigated the grievances of the public, and by its decision had swept away that monster grievance—viz., the claim of the companies to get their maximum dividend under all circumstances, through the operation of the revision clauses in the Act of 1868. The Board of Trade threw its own commissioners overboard. This machinery of

revision had been wholly condemned by the select committee, and they had brought the question down to the solid footing of 3s. 9d. per 1000 feet of 16-candle gas, leaving the companies to look after their dividend, with the proviso that before it could ever rise above 10 per cent. there must be a corresponding reduction of price to the consumer. So stood the case. Whether any solution of the gas question would be permanently satisfactory which did not include a transfer of the gas supply to the municipal bodies, he did not presume to say. But even as regarded such a transference by purchase, he thought the results of their efforts that year had removed many difficulties. The claim of the companies to their so-called statutory dividend of 10 per cent., under all circumstances, had at length been annihilated, and they might rely upon it that any further proposals to purchase would not be met by such demands as the Chartered Company advanced this year, their proposal being that the purchase should be made by paying to their shareholders such an amount in the Three per Cent. Consols as would yield them a dividend of 10 per cent. upon their capital invested in gas shares! So preposterous a demand showed only too plainly the high-handed monopoly which the gas companies had been enjoying. Well, they proposed to solve this long-pending question by the most effectual and permanently satisfactory solution possible—namely, by purchase. The Government, however, declined to support them in that project, and hence they had to abandon it, and it appeared to him that they must abandon it. But he felt assured of this, that under any other scheme that might be adopted, there would be no permanent satisfaction, no lasting concord between the public and the gas companies, unless they obtained some influence in, or check upon, the management of the gas supply—in short, some degree of municipal representation. He did not suggest this in any spirit of hostility to the gas companies. He did so simply in order that the impending legislation might be final, and to be final it must be permanently satisfactory. It was not necessary or fair to ask for anything like an equal share in the management. He had great trust in the power of truth and common sense; and he believed that, even with a comparatively small measure of municipal representation, confided to able, competent, and honest men, it would be possible to attain an adequate solution of this long-existing difficulty, and for the first time establish harmonious relations between the public and those monster monopolies—the gas companies. The proposed amalgamation of the Chartered and the Imperial Companies would, in his opinion, and, he doubted not, in the opinion of every one who had studied the subject, if the said amalgamation was to be taken *per se*, prove highly detrimental to the interests of the public. He, therefore, suggested, for the consideration of that Court, that in the event of this amalgamation being proceeded with, the committee should be empowered to insist, in the strongest manner, before the Board of Trade, upon the necessity for accompanying such a measure of extensive amalgamation by some measure of municipal representation in the management of the amalgamated company. He was glad to see, as well as to know, that the wisdom and necessity for such municipal representation was not only admitted, but publicly stated, by the wisest advisers of the gas companies. Throughout the whole proceedings they had acted in concert and harmony with the Metropolitan Board of Works.

Deputy FRY said he could not see so much cause for congratulation in the result of their proceedings before Parliament this year as the chairman of the Gas Committee would appear to think. He by no means approved of all the provisions of the Regulations Bill. It was well known that gas could be sold at less than 3s. 9d. per 1000 cubic feet, and why should they sanction the fixing of this amount? It was proposed that if the price should be reduced to 3s., then the dividends of the companies should be more than 10 per cent. If it so happened that the companies were able to supply for 3s. (and he believed that they would), the citizens of London would positively be parties to a transaction that would bring into these companies perhaps 12 or 14 per cent. Was that the right thing for them to do? It seemed to him that what was proposed was that they should tie their hands by a system entirely in favour of the gas companies as against the consumers. It was not fair or right that it should be brought before them as such a wonderful improvement upon the existing state of things. Some other arrangement might be made more beneficial to the consumers.

Mr. W. S. GOVER said there was a want of connexion between the report of the committee and the speech of the chairman in moving its adoption. The report was simply a recapitulation of facts, and contained no recommendation whatever; but the chairman of the committee made a recommendation which was not contained in the report. He thought a clear line of policy ought to have been laid down by the committee for consideration by the Court, and with this view he moved as an amendment that the report be referred back to the committee for reconsideration.

Mr. R. N. PHILLIPS seconded the amendment.

Mr. LAWLEY drew attention to the last number of the JOURNAL OF GAS LIGHTING, in which the editor stated his opinion that the Corporation would oppose the proposed amalgamation of the Chartered and Imperial Gas Companies, because the Metropolitan Board in this matter led the Corporation by the nose. He expressed a hope that in this question the chairman of the committee would be able to assure the Court that this was not the case, and that the committee would consider the Corporation first and the Metropolitan Board second. The Corporation had taken an interest in this matter many years ago, and it could not be said of them that they followed the lead of the Metropolitan Board. On the general question he joined entirely with Deputy Fry in protesting against the proposal to fix 3s. 9d. as the price the consumers should be compelled to pay, as he fully believed that gas could be supplied for 3s., and a profit of 10 per cent. realized by the companies.

Mr. BONTEMS expressed his opinion that the result of the efforts of the committee during last session had been just *nil;* they had been left under the same action as before. He believed the committee would do nothing, in the House of Lords at least, to deprive those gas shareholders who were receiving it of their 10 per cent. The lesser dividends would remain as they were. Under the Act applying to the City, those within the City were now supplied with gas at 3s. 9d., and the companies could get no addition to their 10 per cent. dividend under any circumstances. They could not pay income-tax out of their earnings, or damages for accident, and so on; these charges must come out of the dividend. So the citizens had nothing to gain by the Regulations Bill, which, indeed, would enable the companies to pay more than 10 per cent.; they would get payments for accidents and defalcations, now by the existing Act thrown on the dividends. The Regulations Bill would do more harm than good to the City. No doubt the bill would benefit the Metropolis, and in this sense it might be said the Metropolitan Board of Works were leading the Corporation by the nose.

Mr. F. COX pointed out that the committee asked for an instruction from the Court, and he thought they ought to receive that. He reminded them that Mr. Bontems's bantling of 1868 had been mischievous in furnishing the revision clauses. It was under these that the Chartered Company had obtained powers to charge 5s. per 1000. Since 1868, £4,000,000 or £5,000,000 had been added to the capital of the gas companies, and upon this had been secured 10 per cent. What they ought to have done at that time was to have suggested some course for a restriction upon the augmentation of capital. As the Government would not agree to the Purchase Bill, he trusted the committee would be empowered to introduce into Parliament next year the Regulations Bill of last session. He looked forward to the time, however, when the supply of gas to the Metropolis would be in the hands of the local authorities; but in the interim he regarded the limitation of the capital of the several companies as a most important point in the interests of the consumers.

Mr. M'GEORGE having spoken in favour of the amendment,

Mr. BEDFORD said he thought justice had not been done the committee. At the same time he questioned the wisdom of fixing 3s. 9d. as the future price to be paid for gas, looking to the increase of consumption and the increase in the value of gas products. It would be something like confiscation to deprive gas shareholders of their rights, but he was disposed to favour the reintroduction into Parliament next year of the Regulations Bill, as under its provisions it would be to the interests of the gas companies that they should be as economical in their management as possible, while under the existing law the contrary was the case. He had not the slightest hesitation in saying that the cost of the production of gas would decrease in the future, and if only on that one point, of the price to be charged to the consumers, he thought the subject should be considered by the committee.

In answer to a question, Mr. SHAW said that the Government did not approve of a downward and an upward sliding scale.

Mr. H. L. TAYLOR thought they might at once determine upon an instruction to the committee, either to prosecute the Purchase or the Regulations Bill.

After some discussion upon the point of order, whether, as the report contained no recommendation, it was competent to the Court to entertain the motion, in the course of which Mr. SHAW said the committee desired the instructions of the Court,

The amendment was put and carried.

Upon its becoming the substantive motion, Mr. SHAW moved another amendment—"That it be an instruction to the committee to proceed with the Regulations Bill during the next session of Parliament." This was seconded by Mr. HORA.

Mr. GAME, a member of the Gas Committee, expressed himself favourable to the proposed reference.

Mr. J. BECK complained that the report gave the Court no information as to the opinion held by the committee on the question, and supported the motion to refer the subject back.

Mr. H. L. TAYLOR thought the committee should have recommended a decided course of action, but as the Purchase Bill was entirely out of the question, he trusted the Court would at once instruct the committee whether they would proceed with the Regulations Bill next year, or let the matter drop altogether.

Mr. LAWLEY said he strongly objected to the Regulations Bill as it now stood, as under its provisions the citizens were bound to this price of 3s. 9d.

Mr. CLEMENTS explained that certain companies were able to supply gas at a cheaper rate than others, owing to operating in a circumscribed circle, and having a comparatively confined capital upon which to pay dividends.

Deputy FRY thought it very unfair that the Court should be asked at a moment's notice to pledge itself to support the Regulations Bill.

On a division, the amendment was carried by 46 to 32.

Mr. M'GEORGE moved another amendment—"That the debate be adjourned," and this was seconded by Mr. LAWLEY, but was put and lost.

Mr. LAWLEY moved, as an amendment, the adjournment of the Court; and Mr. W. S. GOVER seconded the same, taunting the majority with tyrannical action.

The amendment was divided upon, and negatived by a majority of two, those voting affirmatively numbering 38.

Mr. BONTEMS then proposed the following amendment—"That the Gas and Water Committee be instructed to compare the proposed Regulations Bill with the City of London Gas Act of 1868, and report wherein it would benefit the citizens that the latter should be repealed and the former substituted."

Mr. HARTRIDGE seconded this amendment.

After some observations by Mr. ISAACS and others, the amendment was put, and the LORD MAYOR declared it to have been carried, Mr. SHAW saying he should take it as the desire of the Court that nothing more was to be done with the question this year.

The COMMON SERJEANT (Sir Thomas Chambers) said that, even if the bill were treated as a private one, there would be time to proceed with it after the next calendar court.

The amendment of Mr. Bontems was affirmed as a substantive resolution.

METROPOLITAN BOARD OF WORKS.—At the meeting of the Board on Friday last, the clerk read a letter from the South Metropolitan Gas Company, expressing approval of the principles of the Gas Regulations Bill, and stating that, if the bill did not become law next year, the company would themselves promote a private bill, placing themselves under similar conditions to those approved by the select committee of last session. On the motion to refer the communication to the Parliamentary Committee, Mr. Runtz said the Commercial committee approved of the proposal of the Board last session, and it was now embodied in their Act of Parliament. As the companies understood the proposal of the Board, they would one by one agree to it. He was not surprised at the South Metropolitan concurring in it, for the idea of the sliding scale was due to their engineer, Mr. Livesey.

METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health on the composition and quality of the metropolitan waters in October, 1875:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen.		Hardness.	
			As Nitrates, &c.	As Ammonia.	Before Boiling.	After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	19·63	0·094	0·167	0·002	15·4	3·3
West Middlesex	19·43	0·046	0·131	0·000	15·0	3·3
Southwark and Vauxhall	18·92	0·064	0·166	0·002	14·8	3·3
Chelsea	19·33	0·056	0·131	0·001	15·4	3·4
Lambeth	19·40	0·060	0·125	0·001	15·4	3·3
Other Companies.						
Kent	28·09	0·011	0·359	0·000	21·2	5·6
New River	18·47	0·030	0·166	0·000	14·7	3·0
East London	17·57	0·049	0·181	0·001	14·4	3·7

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases but the following, when it was slightly turbid—namely, in those of the Grand Junction, the Southwark and Vauxhall, the Lambeth, and the Chelsea Companies. The average quantity of water supplied daily to the metropolis during the preceding month was, according to the returns of the water companies to the Society of Medical Officers of Health, 126,235,570 gallons; and the number of houses supplied was 520,057. This is at the rate of 36·6 gallons per head of the population daily. The last official return from Paris stated that the average daily supply per head of the population was 28·2 gallons; but this includes the water used for the public fountains, and for the ornamental waters in the Bois de Vincennes and the Bois de Boulogne. HY. LETHEBY, M.B.

HALIFAX (CORPORATION) GAS AND WATER WORKS.

At the Meeting of the Halifax Town Council on the 27th ult.—the MAYOR presiding—the quarterly reports were presented.

Water-Works.

Since the last report was issued, the quantity of water in store increased from 541,153,000 gallons to 589,261,000 gallons, the quantity in store at the last meeting of the Water-Works Committee, held on the 19th inst. Since then all the reservoirs have become full to overflowing, there is therefore no anxiety felt now on account of the water supply. Notwithstanding the large increase in the demand for water, which has been experienced this year, the committee will be in a position to meet a demand which they hope will be much larger during next year than it has been during the present. The reservoir at Widdop is now nearly finished, and as a consequence the present supply of water will be largely augmented within the next ten months. In the last report which this committee presented, reference was made to the fact that it had decided not to supply water for trade purposes after the end of September last, except on an agreement from the parties taking such supply that they would hold the corporation blameless for any damage or loss resulting from the bursting of pipes. The committee is happy to state that such agreement has been entered into by nearly every consumer. The committee have also to report that it has now ceased to do any private plumbing work. All such work will hereafter have to be done by plumbers authorized by the corporation, for whose guidance a code of regulations has been drawn up. Many of the respectable plumbers have already signed those regulations, and been authorized accordingly. No water will be supplied to any premises, the plumbing work in connexion with which is not from this time done by authorized plumbers. Any respectable plumber who may wish to be authorized has only to make the application, and sign the code of regulations, and be at once put upon the list. The committee is still alive to the fact of a considerable leakage of water, and to the importance of ascertaining something like the extent of the same, and where and how it arises. Instructions have therefore been given to Mr. Paskin to take immediate steps by testing the mains and service-pipes. It is hoped that before another report is issued the experiments which he may make will have led to the application of remedies, which will in great part have prevented the leakage which is believed to be going on. As to the action taken by the committee in reference to the matters required to be included in the parliamentary bill about to be applied for, an account has already been given to the council in committee, and as the Parliamentary Committee will have further to report to the council, it is not necessary that any further reference should be made to it here. The committee regrets that in framing the estimates for next year, it finds itself unable to meet the entire expenditure of the water-works department out of the income, and that there is likely to be a deficiency of about £2000, which will have to be provided for out of the rates. The committee hope, however, that by the time the present water-works scheme has got fully developed these works may be managed with a very much less pecuniary loss to the ratepayers than is the case at present, and that before many years hence they may be managed without a loss at all. It has also pleasure in reflecting that even the present loss is more than compensated by the advantages which these works afford to the town when looked at not only from a sanitary but also from a trading point of view.

Gas-Works.

The Gas-Works Committee have to report that the quantity of gas made for the nine months in this year ending September was 161,445,000 cubic feet, and for the corresponding months of last year the quantity made was 151,998,000 cubic feet, being an increase of 9,447,000 cubic feet, or 6·21 per cent. For the quarter ending Sept. 30, the quantity made was 38,366,000 cubic feet, and in the corresponding quarter of last year the quantity made was 34,394,000 cubic feet, being an increase of 3,972,000 cubic feet, or 10·54 per cent. The cost of manufacture and distribution in wages for the present quarter is £1175 9s. 4d., and the cost of the same in the corresponding quarter of the year 1874 was £1194 6s. 8d., being a decrease of £18 7s. 4d. The average illuminating power for the last quarter has been 17·55 sperm candles—maximum, 19·37 sperm candles; minimum, 15·6 sperm candles. The committee have also to report that they have erected a small test works, for carbonizing and working off the 1-100th part of a ton of coals, including a small test gasholder of 150 feet capacity, so that they will shortly be able to test accurately all the classes or varieties of coals consumed upon the works. A laboratory for testing the gas for illuminating power, and for all impurities, is erected, and at work. Tests have been made, and the manager reports that on the 20th inst. there were 7 grains of ammonia in 100 cubic feet of gas, and 8·6 grains of sulphur, other than sulphuretted hydrogen, in 100 feet, the lowest parliamentary standard for sulphur impurities being 15 grains. The committee have pulled down and rebuilt the old retort stack in No. 2 retort-house, and a portion is now ready for work. They have also repaired the roof or covering of the large tar tank, which was in a very dangerous state, the pillars having broken through the iron floor of the tank, and sunk into the clay ground or puddle underneath. They have put in ten cast-iron pillars upon a concrete foundation, and the roof is now, they believe, permanently secured. They have also repaired a great portion of the yard; the space between No. 1 and No. 2 gasholders has been asphalted; the whole of the ironwork, including gasholders and columns, and the woodwork, which is exposed to the weather, has been cleaned and painted. The offices have been painted and papered, and the desks and fixtures enlarged and improved; the meter and exhauster houses have been coloured and painted, and the whole works have been put into a good and efficient state of repair; and the committee respectfully invite and would be pleased if the members of the council, who feel interested in the gas-works, would go to view and examine the same, and acquaint themselves with the state and condition thereof.

Mr. WHITLEY moved the estimates for the rates for the ensuing year, and said the Gas Committee were of opinion that they would have £1500 profit, which the Finance Committee had not touched for this reason. In the report which was issued 12 months ago, it was stated that the "Gas Committee estimate the profits for the year 1874 at £8000, and for the year 1875 at £4800, out of which sums, however, provision for depreciation will have to be made." From this it would be seen that the total estimated profits for the year 1874 and 1875 were £12,800, out of which the report recommended £7800 should be taken and applied to the relief of the borough rates. That had been done, but the report went on to say "if the estimate of the committee be realized, it will leave £5000 to go to the depreciation-fund of the gas-works for the years 1874 and 1875." It appeared to the Finance Committee that seeing that that report was adopted by the council, it prevented them appropriating the £1500 above referred to—it appeared to the committee that unless the council decided to alter the resolution adopting that report it was pledged to apply that money to the reduction of capital, and it was simply because of the existence of that report, which the council had adopted, that the Finance Committee could not see their way clear to deal with that £1500. Although, however, the committee had not dealt with it, yet they had only recommended rates which were calculated barely just to cover the expenditure of 1876 with a margin of only £150, so that really if the council were ultimately to decide that the £1500 should be appropriated, the margin would not even then be too great.

The motion having been seconded,

Mr. T. SMITH said it was the duty of the council, if they possibly could, to reduce the rates to the least possible amount, and he thought they might do so even more than was proposed to do. He had a statement showing that the gas profits would be £4500 more than they had been last year, and he advocated the appropriation of the whole to the lowering of the borough rates. Having pointed out the amount of money expended during the half year on the repair of the gas-works, he maintained that there was no need for the Gas Committee to retain the sum of £1500 spoken of by Mr. Whitley. There was no depreciation at the gas-works, because they were kept in good repair out of revenue, consequently where was the necessity of a depreciation-fund? There was not a word in the Act of Parliament to compel them to have such a fund, and inasmuch as the Finance Committee could appropriate about £2500 more of the gas profits if they liked, he moved an amendment that the aggregate rates be 5s. instead of 5s. 2d.

Alderman THOMAS, seconded the amendment.

Mr. SCARBOROUGH said he was surprised to hear Mr. Smith's remarks respecting the depreciation of the gas-works, for he could not conceive for one moment that Mr. Smith could maintain that every penny which they got for their gas over and above the cost price of it ought to be appropriated to the reduction of the borough rates. They had to keep their works in a good state of repair, and although in recent years they had been kept in better repair than previously, the fact remained that formerly a large amount had been put down for extensions which ought to have gone for repairs, and he thought they ought to have some particulars from those gentlemen with respect to what had been paid for repairs in years past, and then they would be in a position to say whether the figures were correct or not. It was not respectful to the council that they should have the quarterly report of the Gas Committee put into their hands only on that evening, because by that means they had had no opportunity of considering it. When it was asked for, the Finance Committee were told that they could not have it, and in future he trusted greater respect would be manifested in such matters. Even supposing the gas-works did make the amount of profit stated by Mr. Smith, that ought to go to reduce the price of gas, and not other rates. The consumers of gas were paying far more than their fair portion of the rates, and he should therefore strongly support the resolution.

Mr. LONGBOTTOM said it would be apparent to the council that Mr. Smith lived very joyously in the present; he did not look back upon the past, and had no eye to the future. As to the legal question of provision for depreciation spoken of by Mr. Smith, the fact was that the Gas Committee and the council had broken the statute law over and over again. They ought in past years to have provided for the renewals of their works from time to time out of the revenue; but they had not done so. It had been proved over and over again, for he had asked the question himself as to whether a gasholder had not been taken down, and gas-mains taken up, disposed of as old iron, and a simple reduction of the value of the old iron written off in the books. That had been going on for years past, and there must stand to the debit of capital account a very large sum which ought to have been paid out of revenue. If such illegalities had been practised in the past, it was quite legal to correct them now. He agreed with Mr. Scarborough, that if there was to be any alteration whatever, seeing that the Gas Committee were making such enormous profits, and probably would be able to do so in the year to come, the more proper course than the one the Gas Committee were seeking to adopt by their amendment, would be to reduce their gas still more, and make it 3s. 6d. per 1000 feet. By so doing, the corporation would reach by their 5s. 2d. rate those who consumed no gas at all.

Mr. DYSON thought that gas ought to be sold at as low a price as possible, and at a price that would not leave a deficiency at the end of the year.

Mr. RILEY said it was very amusing to hear the gentlemen who had been asking so long for Mr. Hawksley's report upon the value of the gas-works ignore it now after their expressed desire to have an independent opinion thereon laid before them. Mr. Hawksley told them what the value of the works was, and they ought not to go further back than that report, because if the gas-works were kept in their present state of efficiency, or the state in which Mr. Hawksley found them, they would have no right to provide a very large depreciation-fund.

Mr. KERSHAW approved of the 5s. 2d. rate, because it was direct taxation; but he was also glad to hear the Gas Committee were in such a good position as to have such large profits.

Mr. WALSH said, if there was any reliance to be placed upon the statement as to a surplus of gas profits, it ought to be applied to the reduction of the price of gas.

Alderman WAYMAN said Mr. Hawksley's report, in his opinion, was entitled to more respect than some gentlemen of the council were inclined to give it. He considered that report was an honest one, and they ought to take considerable comfort from the statement made therein that the amount of money expended on the gas-works and standing on the books against it was not an unreasonable one. Notwithstanding that, he was not opposed to the reduction of the capital account to a more reasonable amount. As had been stated over and over again, there must be something that wanted explaining, when it was considered that the cost in interest upon the money that had been expended was so much in excess of other towns. It would be a very great mistake indeed if the council were to decide not to adopt the recommendation of the Finance Committee.

Alderman BROOK also supported the resolution, remarking that it would be far better to have a surplus at the end of next year than to be short, and whatever the Gas Committee could make by that time, it would be satisfactory; but, if the profit reached such an amount that a reduction of the rates was possible, it would be the fairest way to reduce the price of gas.

Mr. WHITLEY having replied, the amendment was lost, and the original resolution carried.

On the motion of Mr. SMITH, seconded by Mr. RILEY, it was resolved that the price of gas, from the 1st of January next, should be 3s. 8d. per 1000 cubic feet within the borough, and 5s. per 1000 cubic feet outside the borough.

DEATH OF MR. JOHN WRIGHT.—Died on the 2nd inst., at his residence, Barham Road, South Croydon, Mr. John Wright, aged 64 years, for many years the much respected representative of Messrs. Hulett and Co.

PONTYPOOL PUBLIC LIGHTING.—The Gas Committee of the Pontypool Local Board reported to the meeting of the board last week, that their expenditure upon the gas alterations amounted to £188 3s. 4d. They pointed out the fact that the greater part of this amount was expended in the purchase of the street-meters, and in the complete renewal of the services from the main to the pillars. The items were as follows:—

	£	s.	d.
Cost of meters, &c.	55	13	6
Cost of new services	82	2	6
Alteration of lamps, new governors, &c.	50	7	4

The committee congratulated the board upon the result, financially, of the working of the meter system. Under the old arrangement the cost stood as follows:—

	£	s.	d.
Seventy-four lamps at 95s.	351	10	0
Two lamps at 168s. 4d.	15	16	8
Fittings for year 1873–74	20	18	4
	£388	5	0

The total cost of gas for the public lamps for the year July 1, 1874, to July 1, 1875, was as follows:—

	£	s.	d.
Paid gas company for gas, &c.	200	11	0
Paid gas company for repairing lamps, &c., prior to the adoption of the meters	11	16	2
Paid lamplighter, Nov. 21st to June 30th	31	0	0
	£243	7	2

This showed a saving upon the year of £144 17s. 10d. It would at once be seen that in less than one year and a half the whole outlay for the alterations would be saved by the reduced annual expenditure. The committee remarked that they were not forgetful of the fact that this saving had been effected partly by the non-lighting of the lamps for a portion of the year. Still, a little calculation would show that had they been lighted every month, a very considerable saving would have resulted even then from the adoption of the new system. Thus the total cost of gas for five months, January to May, was £101 0s. 1d. Assuming that the lamps were lighted for six hours per night during June, this would give a consumption of 810 feet per lamp, or 65,560 feet for 76 lamps for the month, which, at 4s. 3d. per 1000 feet, say £13 17s., gave the following result:—

	£	s.	d.
Cost of gas, January to May	101	6	1
Do. for June	13	19	0
Lamplighter for six months	26	0	0
	£141	5	1

Deducting the amount from half the cost for the year under the old arrangement, retaking £141 from £194, there was a saving of £53 on the half year, or £106 on the year.

SOUTH METROPOLITAN GASLIGHT AND COKE COMPANY.

An Extraordinary General Meeting of this company was held at the London Tavern, on Monday, Nov. 1—THOMAS BRIDGE SIMPSON, Esq., in the chair—"To consider the Metropolitan Gas Bill, which passed committee in the House of Commons in the last session of Parliament, and whether the directors should be recommended to oppose the bill or otherwise, on its reintroduction in the next session of Parliament."

The SECRETARY (Mr. G. Livesey) having read the notice convening the meeting,

The CHAIRMAN said: Gentlemen, this large and respectable gathering of shareholders we are very glad to see, because we shall now have an opportunity for ascertaining your opinion as to the way in which you desire the company should be conducted. But I think it is right that I should first explain to you the reasons why the directors originally opposed the bill of last session. That bill introduced the principle of the sliding scale; that was the only benefit we should have obtained from it, and you cannot suppose we should have objected to the sliding scale if we had thought we were dealing with men upon whom we could depend. We believe that, under that bill, we should still have been fully secure of our 10 per cent., because we have one of the finest businesses in London—everything is on our side; the only danger was whether it was wise to give up an Act which already gives us our 10 per cent. for one which regulates dividends upon a sliding scale, the advantages of which might, after all, be visionary, You know it is not the practice of Parliament to wrest an Act from a company, but, if they had done so in this case, might they not also, three or four years hence, adopt the same course, and, finding that we were profiting by the sliding scale, say that 12½ per cent. was a most outrageous dividend to pay. It was said at our last meeting by an honourable proprietor that it would be very easy for us to continue supplying gas at 3s. or 3s. 2d.; but you must recollect that, under the bill of last session, we should have been required to furnish gas of two or three candles higher illuminating power, which, according to the opinion of gas engineers, who calculate the cost of each candle above 14 at 2½d., would have added 5d. per 1000 cubic feet to our cost of production. Taking it altogether, therefore, we thought the advantages of the bill were so visionary that we ought not to give up our own Act for it. Most of us, when we were boys, read Æsop's fables, and will remember the story of the dog crossing a stream with a piece of meat in his mouth. Seeing his shadow in the water, and mistaking it for that of another dog with a larger piece of meat, he attempted to possess himself of the prize, and in doing so lost the substantial food he had possession of. Well, we thought this bill offered us a bait which would turn out to our injury, and that we ought to oppose it. Of course, if we could, by means of it, secure an extra 1½ per cent., there is no one here so foolish as to refuse it; indeed, we should willingly accept it, and not wait to have it forced upon us. But we looked upon it as involving bad faith, and as a violation of the usages of Parliament; and we therefore felt it best to oppose that which would deprive us of all which had been secured to us by our existing Act. When you knew that this was the view we took, I am quite sure that all of you, and especially Mr. Foster—to whom we are so much indebted, who put our books to rights, and lent us money at one time to carry on the business—will feel that we should have been doing wrong if we had not opposed the measure. I will just read to you what Mr. Cardwell said on this point; it will not occupy your time long. Mr. Cardwell was chairman of the committee of the House of Commons when a similar attempt was made, some years ago, to interfere by fresh legislation with the terms upon which the companies had raised their capital. He said, "I do not consider it just to pass such a general bill; but when a company come to Parliament requiring more power or additional capital, I will then revise the terms of their Act. It is not consistent with parliamentary faith to cut down their dividends—I will not do it." He said also that he considered the faith of Parliament was pledged to that agreement, and he would not interfere with the dividends. But the bill of last session would, in the event of a great advance in the price of coal, very much interfere with our dividends. And independently of that, I think it is against the interests of the gas companies altogether that a general bill of this character should be passed. I will tell you what proceedings were taken upon it. The bill was introduced on the 3rd of March. We then had an interview with the Home Secretary, Mr. Cross, who, after listening very patiently to our statements, promised to give them his attention, and he did so. On the 14th of March we had an interview with Sir Charles Adderley, the President of the Board of Trade, and he also said the matter should have his attention. The first of his considerations of the question was the introduction of the sliding scale, but that scheme was not introduced until after the committee had begun their sittings. I have before me now the remarks of the Chancellor of the Exchequer when the motion to read the bill a second time was made in the House. I will, however, only pick out two or three words to read to you. He said "the House would do well to give a second reading to the present measure, so that it might be considered by a select committee, which he hoped might be a strong one, and put into a proper shape. Special reference had been made to the 6th clause, limiting the price to be charged for gas of a certain standard. This clause stipulated that gas of 16 candles, however, should be charged 3s. 9d. per 1000 cubic feet; and it was provided that if the price were increased, the dividend was to be reduced. That clause would, in his opinion, amount to a breach of faith, and was an unfair clause to be adopted. If that clause were to be considered an essential principle of the bill, the House would, he thought, pause before it gave its assent." And at the latter end of his speech he said, "It would be the duty of the Government to watch the bill carefully when it came back, and if that clause came back in its present shape, it would be impossible to allow the bill to proceed any further." Now, gentlemen, that clause still remains in the bill, which, however, for want of time, did not pass the third reading. Whether they consider the sliding scale is to be given in lieu of anything further, I do not know; but, certainly, I think as far as the sliding scale is concerned, we can have no objection to it whatever—not the least—unless we are to regard it as a bait thrown out to attract us, and to take from us our chance of getting 10 per cent. I confess I do not like the idea of a bill being thrust upon us for the purpose of taking from us the privileges we enjoy under existing legislation. Let me just read a line or two to show you what is the opinion of the Editor of the JOURNAL OF GAS LIGHTING upon this point. He says:

> Our report of the meeting of the South Metropolitan Company will be perused with great interest. The proceedings were indeed remarkable, and a part of them we shall leave to the judgment of our readers, without comment. Most of those who peruse these lines are, no doubt, well acquainted with the circumstances of the South Metropolitan Company. They are the most prosperous of the London companies. Their profits may be said to be assured for all time. They are working under an Act which was forced upon them, but which it is, nevertheless, to their interest to maintain. It is now sought to induce or persuade, if these are correct terms, the directors to throw over their present Act, and promote a bill in accordance with the views of the metropolitan authorities. This can hardly be said to be done in the interest of the South Metropolitan Company themselves, who cannot be better off than they are at present. It is a distinct and, we may say, an avowed act of hostility to other companies less fortunately circumstanced. The issue of the shareholders meeting about to be held can hardly be doubtful, but still we would venture on a remonstrance. We fear we talk to deaf adders, but that shall not prevent us from making an appeal to what we know to be an adverse majority. We say, then, to the shareholders of the South Metropolitan Company: "Your dividends are assured; you can go on doing the best possible for your customers, and continue to gain all the honour that is to be obtained by supplying gas at a low price, and no one will dream of interfering with you. Why, then, should you, by playing into the hands of the authorities, seek to disturb the parliamentary compact which at present exists? Be content to live and let live.

No one can doubt from this passage what the opinion of the Editor is on this point, and I think it is a matter which is worthy of our consideration. At the same time I can assure you, on the part of the directors, that whatever you determine upon at this meeting to-day, we shall implicitly adopt. We have no desire to do otherwise. Let us have your calm and deliberate judgment in the matter, and we shall certainly act upon it. You must, however, acquit your directors of not doing rightly in opposing the bill in the last session. We had no confidence in the persons by whom the sliding scale was proposed, and, in fact, we must doubt the honour of men who, at the last moment, tried to fix this company with a 3s. 3d. maximum, while the other companies were to have 3s. 9d. It is no answer to say that they did not succeed; they would have done so if they could, and they tried to do it. It is these people we have to fear; if it were not so, I would say, "Let us by all means adopt the bill at once;" and if you now decide that that is the right course, your directors will carry out your wishes.

Mr. PRIDDEN: I think the motion I intend to propose will meet the views of the chairman, and possibly of every shareholder present. I am glad that this question has had a month's consideration, because in the interval since our last meeting an event has occurred of great importance—viz., the amalgamation of the Chartered and Imperial Companies. These companies represent between them at least eight or ten millions of the whole capital of the London companies, leaving not more than two millions which can be said to be at all in opposition to the present bill. The Independent Company are not; the Commercial have accepted it, and my strong impression is, that either through the Board of Trade or the House of Commons this bill will be forced in with any amalgamation scheme of the Chartered and the Imperial. We stand, therefore, in a different position to what we did this day month; indeed, we should stand alone with scarcely any one with us except the London, Phœnix, and Surrey Consumers Companies. Under these circumstances we ought to reconsider the matter, and I think the board will be willing to reconsider it. There is one point which must not be forgotten. The bill of last session was sanctioned by Mr. Forster, whose name, on account of the part he took in the Education Bill, carries immense weight in the House, and to oppose a measure stamped as this is with his approval will be a very difficult thing to do. Then again there is the evidence given in favour of it by our secretary, and very valuable evidence it is. No one who knows the Livesey family, as connected with the South Metropolitan Company, but knows also that, whatever the company owe to the directors, they owe very much more indeed to the late Mr. Thomas Livesey.

The CHAIRMAN: I have always said so.

Mr. PRIDDEN: Since the late Mr. Livesey left the world we have been much indebted to his son, who has faithfully trodden in his footsteps. The evidence of Mr. George Livesey was said by the chairman of the House of Commons committee to have carried the bill. For this company, therefore, to come forward in opposition to a bill which our own secretary has been the means of carrying, would be a most awkward and inconsistent course to pursue. There was an attempt last session to fix upon us a price of 3s. 3d., while the other companies were to be allowed 3s. 9d.; and, perhaps, if next session the bill should get into the House of Lords, it may be attempted again. It would be a very unjust thing, but we have seen such strange things done in Parliament that this is quite possible, and we must prevent it by every means in our power. Now, I want to call attention to another matter. We are at the present time selling gas at 3s., and charging no meter-rent. I believe Mr. Livesey will tell you that a meter-rent is equal to about 2d. per 1000 feet on the consumption.

The SECRETARY: Not quite so much.

Mr. PRIDDEN: Well, call it 1½d.; therefore, our price is brought down from 3s. to 2s. 10d. or 2s. 10½d. Another thing I would point out, which is this. At present we are not earning profit enough to pay more than 10 per cent. dividend. It is said, and I believe truly, that if we paid more than 10 per cent., or laid by profits beyond that amount, there would be a great outcry. At present, as I say, we cannot pay more, but I have no doubt that if the normal price of coal continues, we shall be able, by the good working of the company, to earn more than 10 per cent. at a 3s. price, so that we shall be in a position to pay a higher rate of dividend. Then there is another point. I think no one who looks into the future can doubt that, in the course of four or five years, the gas companies of London will cease to exist. They must be bought up by the public authorities, either the Metropolitan Board or some body specially appointed to carry on the supply of gas. If, then, we are making more than 10 per cent., the price to be paid for our undertaking must be proportionately greater than the price paid to those who earn only their 10 per cent. This is a matter which must not be lost sight of, as far as this company are concerned. But, so far as our price for gas goes, I have no doubt that our directors, whose excellent management is universally acknowledged, not by the shareholders only, but also by the consumers, will not think it desirable, for the sake of paying a larger dividend, to increase it beyond 3s. If the price of coals and other circumstances should permit the payment of a higher rate of dividend than 10 per cent,, with a 3s. price for gas, we shall be all quite willing to receive it, and shall congratulate the directors and ourselves upon such a happy condition of things. Now, I am aware that, under the bill of last session, we should be obliged to supply 16 instead of 14 candle gas, and, as an old gas man of 40 years standing, I am aware that that would entail an extra cost of about 5d.

The SECRETARY: It would not make 3d. difference to us giving the additional two candles.

Mr. PRIDDEN: I think our position in reference to the bill should be one of quietude. Let us watch it if it is again introduced, to see that it is not altered in its clauses; because we have seen an attempt to introduce a 3s. 3d. maximum for this company. It appears that no Act we can ever get but in two or three years Parliament will reverse it. The Phœnix Company at one time might have paid 50 per cent. dividend if they could have earned it. They were not in Parliament in 1860; but down came the Act of that year upon them, and they were limited to 10 per cent. I confess I do not think it was a great grievance at the time, for they never had earned 10 per cent. But I do not think we can get Parliament to pass a bill which shall be for all time without alteration, and if there is hereafter an outcry against us for paying more than 10 per cent., and an attempt is made to alter the provisions of the proposed legislation, we must, to use a vulgar phrase, "Grin and bear it." Mr. Livesey has already pointed out that under the bill, if it passes, for every £1000 extra we divide amonst the shareholders, the consumers will get £3000 or £4000, and perhaps as they will thus get the lion's share of the benefits of our prosperity, they will be more satisfied. I will conclude the few observations I have to make by moving the following resolution:—"That this meeting, feeling grateful to the board of directors for the high state of prosperity, both to the shareholders and to the consumers, to which the directors have conducted this concern, and having perfect confidence in their future management thereof, hereby respectfully recommend to their consideration, that, in the event of the Metropolis Gas Bill of 1875 being introduced into Parliament in the next session, no further opposition be offered thereto, but only that it be watched, to prevent alteration in its present clauses."

Mr. WILBRAHAM seconded the motion.

Mr. ROSTRON: There are two or three considerations which ought to weigh with us in relation to the Board of Works and the new bill. Our worthy chairman has indulged in some observations with regard to our differing from other companies, and that, practically, is the basis of the remarks of the Editor of the JOURNAL OF GAS LIGHTING. We occupy a certain position under the Act of 1860, and within our own district all the interests we have to consider are those of the consumers and ourselves. We have nothing to do with other companies. If it suits a big company to oppose this bill, let the big company take care of themselves. We have to take action on the bill for ourselves, and ought to be guided by the

interests of our shareholders. And, looking at the bill, and the discussions that have taken place upon it, I say it is certainly our interest not to oppose it—first, because, in my opinion (and I have read carefully the Blue Book, and note that Mr. Forster directly intimated the same opinion), our acceptance of the sliding scale must put a stop to all agitation on the part of the Board of Works. It would be impossible for the board to turn round upon us.

The CHAIRMAN: Mr. Cardwell said the same thing about the former Act.

Mr. ROSTRON: Well, my first proposition is that it is not for our interest to oppose this bill, because if it is carried, it will put an end to all agitation on the part of the Board of Works. In the second place I think this bill, if adopted, will render our dividends a certainty. I know that some people are tempted by the notion of high dividends, and if they can get them, they do not trouble much to consider whether they are likely to be constant or not. But the majority of shareholders in gas companies like a certainty; and I think, looking at the Blue Book, and also at the evidence given on the revision inquiry, that our position will be impregnable as regards that. And not only so, but in view of amalgamation or purchase, the price we shall obtain for our undertaking will be considerably more. But there is a third reason, and one which, to my mind, has not been sufficiently alluded to. I was not present at the half-yearly meeting, but I have carefully read the report of the proceedings, and I do not find any direct reference to it, and that is that sooner or later we must go to Parliament for more money. Whether or not, before that necessity arise, we may be bought up, as suggested, is not before us now, and for all practical purposes it does not affect the question. But I say we must, sooner or later, go to Parliament for more capital. We have yet a certain amount of money unexpended—about £70,000, and I am informed that we can exercise borrowing powers to the extent of £50,000 or £60,000. The question is whether, if we accept this bill now—*i.e.*, if we put ourselves *en rapport* with Mr. Forster, and into friendly relations with the authorities, as far as we can—we shall not be much more likely to get better terms with regard to raising new capital, when the time comes that we require it, than if we continue to occupy the extraordinary position we did last year in the lobby of the House of Commons. I was not at the time aware that there was a division in the board; and it appeared to me a lamentable thing that a company like this should be present opposing a bill in committee at the same time that their principal officer (to whose mangement, since the death of his father, our success is due) was supporting that bill by his evidence. I say it is Mr. Livesey's bill quite as much as it is Mr. Forster's. Well, we shall be saved that. Of course, our assent to the bill is based upon the assumption that there will be no tampering with the 3s. 9d. initial price. If we adopt this bill, the Board of Trade and the Board of Works must have a clear intimation of the footing upon which we do it, and there must be a clear understanding that a 3s. 3d. price shall not be dangled before Lord Redesdale. I know what his nature is, and that he might jump at it. If there is any danger of that, I say let us promote a bill of our own, incorporating the clauses of the bill of last session. What position should we occupy if we did so? I think I may say that the other companies would have no *locus standi* against us, and the Board of Works could not consistently oppose, because it would be their own bill. I would, therefore, throw it out for the consideration of the board, whether or not it would not be better, now that we are on good terms with the Board of Works, to apply at once for further capital, and incorporate in our bill the clauses sanctioned last session by Mr. Forster's committee. It is only for that reason I did not rise to second the motion.

Mr. JULIAN HILL, a director: Mr. Rostron has alluded to what passed in committee. I will read to you what Mr. Forster, the chairman of the committee, said, and I may mention that incidentally he stated it was the unanimous opinion of the committee. He said: "The principal clause is undoubtedly clause 6, and I may state, with reference to that, that we are prepared to accept the principle of a sliding scale, but we think it should be uniformly applied to all the companies. I may state that, in passing the preamble, we accept the principle of uniformity in treating the different companies under the bill." And he winds up with this remark: "We have come to these conclusions because we believe it will conduce to the interest of the companies quite as much as to the consumers; and we also believe that it is proposed *bonâ fide* by the authorities, and with the intention of adhering to it, even should it enable the companies to earn more than 10 per cent. dividend."

Mr. JENKINS: The last speaker, Mr. Rostron, has so completely expressed my views that I cannot do better than read the amendment which I intend to propose to the resolution now before the meeting. It is as follows: "That this meeting approves of the principle of the Metropolitan Gas Bill, 1875, and that this company petition Parliament in favour thereof, on the reintroduction of the bill next session. That, in view of the possibility of the said bill not becoming law next session, this company promote a bill of its own, based on the principles of the said bill. That, in view of this company being obliged to go to Parliament, in the course of a short time, for power to raise more capital, the necessary clauses be inserted to enable the company to do so, under a Board of Trade certificate. That, in view of amalgamation or purchase being forced upon this company, the necessary clauses be inserted in the bill. That the directors and secretary take all necessary steps to give effect to this resolution, and send a copy of it to the President of the Board of Trade, the Chairman of the Board of Works, and the City authorities." Now, I wish to make one or two observations upon the reasons which induce me to propose this as an amendment to the resolution which the honourable proprietor has moved. At the last meeting I expressed an opinion that this company ought to have a policy of its own, and ought to have the courage to pursue it in a clear and distinct manner. By doing that we shall satisfy the Board of Trade, the Board of Works, and the City authorities that we, at any rate, know what is proper and right. I do not think we ought to consider that, by the bill of last session, Parliament was laying a trap for us to deprive us of our dividends. But that was the ground, and the only ground, the chairman alleged as a reason for opposing the bill. Now, I think it is acknowledged on all hands that, under almost any possible circumstances, our dividend is secure with a 3s. 9d. limit as to price, as proposed in that bill. At present we are limited by our Act to 3s. 6d., and I understand there is a great objection to going for a revision of price. But we never required to go for a revision. We made gas all through the coal famine, and sold it at 3s. per 1000; the only thing we did to enable us to continue our dividends was to take some £12,000 from the reserve-fund. That sum was made a present of by us to the consumers, for I understand that, under the present Act, we can never put anything to the reserve-fund now that it is gone. But, under the new bill, supposing that, by the exercise of due care and management, we were able to pay more than 10 per cent., with gas at 3s., or, say, 2s. 11d., which we might do if coal continued favourable, we could add something to our reserve-fund. Then, supposing coal went up in an extraordinary and exceptional manner, we should be able to come upon our reserve, if necessary, again to make up our dividends. The coal famine is not to last for ever, and if we have a reserve-fund there is practically no sacrifice of dividend at all. I think, therefore, having regard to the position of this company, that we ought to have the courage to state our opinion, and ask Parliament to let us have a bill of our own, incorporating the provisions of the bill of last session. Now, with regard to Mr. Pridden's motion, it recommends a policy of doing nothing at all, and it seems to me a great mistake. It recommends also that the bill shall be watched, if re-introduced, to see that no alterations are made in the clauses. I think this, too, would be a very objectionable course, because there are some clauses that require to be altered. My amendment refers to the possibility of amalgamation or purchase being forced upon us. If it be, we must accept our position, but I must confess that I would rather we stood alone, for I think we are quite able to take care of ourselves, and to do justice to our consumers. But if either amalgamation or purchase is forced upon us, and we have a clause inserted to enable us to effect it, we shall be spared the necessity of a special application to Parliament to sanction it. With regard to the clause relating to new capital, I understand it is the practice to apply to the Board of Trade, if enabling clauses are in the Act, and the board grant a certificate for the purpose. With these observations, I beg to move the amendment I have read.

Colonel EWART: As a large shareholder, I beg to second the amendment. I am not only a large shareholder, but the representative of one who sat at the board of this company for many years, and I may say that I think it is our policy to act upon the policy which the mover has enunciated. I believe we can do nothing better for the future interests of the company.

Mr. PAULL: Under our present Act, we are only obliged to supply gas of 14 candles illuminating power. By the bill of 1875 the standard was raised to 16 candles. That would be an imposition upon us which will cost 4d. or 5d. per 1000 cubic feet more. We are now charging 3s., but, supposing we have to increase the illuminating power, we shall have to charge 3s. 4d. or 3s. 6d. How will the public like that?

Mr. HILL: Practically, we are now supplying 16-candle gas.

Mr. PAULL: This is an important matter to bring before the shareholders now, in order that we may elicit some information in reference to it. The public will not like the price of gas to be raised, but, if we can supply 16-candle gas at 3s., they will not say a word about it.

The SECRETARY: Our present Act compels us to supply 14-candle gas at a price not exceeding 3s. 6d. We are supplying 14-candle gas nominal, at 3s.; but I ought to say that 14 candles is the *minimum*. During the last 12 months the average quality of the gas supplied by us, as tested by the officials of the board, and entirely independent of the company, has each quarter been 16¼ candles, and the minimum quality has, I think, never been below 15½. And I ought to say one other thing, as I had something to do with it, in regard to the Metropolis Gas Bill before the committee last session. I said to them, "If you want us to supply 16-candle gas as the minimum, on the same conditions as the Chartered Company, by the Act of 1868, are obliged to supply it, it means 17½ candles, because the Chartered Company are exposed to very heavy penalties indeed if they go half a candle below the standard." But the Metropolitan Board met the matter in a very fair spirit, and it was agreed and adopted in the Act of the Commercial Company that, while that company are bound to 16 candles, there shall be no penalty at all unless the gas is below 15½ candles, and then the penalty is only 40s. There is no really substantial penalty unless the illuminating power is below 15 candles, and then the company come under very heavy penalties. With such a clause as that, which I have no doubt would be adopted next session, I should have no fear. As to the 2½d. per candle for increase in illuminating power, it is an exploded fallacy altogether. I said before the committee that it would amount to 1½d., and I gave a very full price then. I do not believe, under the circumstances in which we should be placed, that it would cost us 1d. per 1000 more than it costs us at present to make gas.

Mr. MAY: I think the amendment should be divided. It contains three distinct propositions, and we had better consider each separately.

Mr. BUTLER: It seems to me, from what has been said by the gentleman who moved these instructions to the directors, that we should be perfectly safe in going in with the other companies. We are certainly in a better position than any others, and we shall be quite safe in going in under their wing. I cannot help thinking that if we petition Parliament for a bill of our own, we shall not get such good terms as if we went in with the others. I think it is our policy to remain perfectly quiet, and not interfere at all.

Mr. WHITBY: I would merely refer to a remark made by a previous speaker that, during the coal famine, £12,000 was taken from the reserve-fund, and, in a measure, given to the consumers. He stated that, having taken that money from the reserve, we cannot replace it. Is that true? If so, why was not an additional penny put upon the price of gas, and our reserve-fund kept intact.

The CHAIRMAN: It was a surplus of profits we had. It had really not reached the reserve-fund. We have a reserve beyond that.

Mr. FOSTER: As the chairman so kindly alluded to the efforts of my late uncle in this company, I should like to say a few words, being, I believe, one of the largest shareholders in the concern. My family have been connected with the company for the last 40 years, and two of my uncles have been directors. I am, therefore, very sorry to find that I cannot quite agree with the chairman.

The CHAIRMAN: Understand that I do not wish to oppose; I am entirely in your hands.

Mr. FOSTER: I thought, from one or two remarks that were made, you were opposed to the bill.

The CHAIRMAN: I said I should be glad to accept it if I thought it sincere.

Mr. FOSTER: We have a motion and an amendment before the meeting. I have considered the two carefully, and I am certainly of opinion that the amendment is more to my taste than the motion, and therefore I shall vote for it. We, as a company, are in an extraordinarily good position; we can make 16-candle gas at 2s. 11d. per 1000, whilst others, I presume, who are not making such good gas, charge 4s. Now, it is evident that a manufacturer who can make an article for 2s. 11d., which his neighbour cannot supply under 4s., is in such a good position, that whenever he comes to sell his business, he can do so on remarkably good terms. I hope we shall never have to sell or to amalgamate; but it has been said here that such contingencies may be forced upon us; and I hope the directors will continue to manage our affairs as if no such idea existed. If in the future we work as we have worked in the past, we shall not only be able to do good service to our customers, but also to ourselves. I believe I am right in saying that every year our supply is greater than in the preceding year, and I presume, consequently, that our expenses are comparatively less—*i.e.*, the proportion of working expenses is less each year as the consumption of gas increases. For this reason, therefore, I think that without raising our price we shall be able to realize profits which will enable us to pay the shareholders more than at present they receive, and I consider that, in consequence of the good management of our directors, and those who went before them, and of our secretary, we are fully entitled to have the benefit of.

Captain HEATHORN (a director): If we abide by the Government bill, or bring in one of our own, we become a 12 per cent. company at once, and on such a 12 per cent. we must be estimated. That must be the cypher of our works, and on that value only can they be bought up. Some time since overtures were made to us by the Phœnix Company, and it was inferred by them that because we were not empowered to pay more than 10 per cent., we were in a position to coalesce on equal terms. The Government bill will alter all that, and we shall be estimated either for amalgamation or purchase upon our proper worth. Now, should Government, at no distant period, think fit to take the supply of gas into their own hands, this bill will force our superior position before the arbitrators, who will look at all the facts in their simple bearings. Look at our present position on the map in relation to other companies, and also with relation to the disposal of our residual products. We have very little difficulty in getting rid of coke; we can always dispose of it, while others are not so well placed. These are all considerations which make our company more valuable than others.

Mr. SMART: The question before us to-day is whether we shall oppose the Government bill of 1875 or not. Various proprietors have got up and introduced other topics which are not before us for decision at all. There seems to be a desire on the part of many speakers who have preceded me, to persuade the proprietors that there is a chance of our obtaining, at some time or other, larger dividends than 10 per cent., which, I think, is a most fallacious idea to entertain. Every person with his reasoning faculties about him must see that

there is no possibility of it at all. Why should we put our heads under our wing, and suppose we are invisible, and then attempt to reason upon that as a fact? We have to take facts as they are, and will always remain. We shall never have more than a 10 per cent. dividend; and what we have to consider is simply whether we shall accept the Government proposition of 1875 or not. It is a proposition founded and based upon principles entirely opposed to the interests of gas companies, and we must really try and convince ourselves of that fact. We are a gas company, and we are asked whether or not we will oppose a bill brought into Parliament purposely in opposition to our interests. How can we say that we will support it? How do we know that coals will always be at their present price? How can we, with past experience before us, and seeing that coal is actually rising in price, and will continue to do so, accept these terms? Every one who has studied the question is of opinion that the future price of coal will be much in excess of its present cost. We see ourselves in our best position now, and we are asked to accept a bill based upon the present state of things. It appears to me to be a bill founded in iniquity; the principle of it is injustice, and we are asked not to oppose it! I have a large stake in this company, and I feel that our interests—our permanent interests in futurity demand that we should oppose a bill that is based on injustice, and proposes to rob us of our dividends. The benefits it offers are trifling; they merely, as it were, draw a hare across the path to deceive us. The bill will, some time or other, rob us of our rights, and if we are wise and prudent we shall oppose it.

Mr. MAY: I am glad to hear the chairman say that the directors are prepared to carry out the wishes that may be expressed by the shareholders. I believe that is the most honourable course they could take. There has been a division of opinion amongst them on the point in question, and I am happy to see that the difference will be settled in so amicable a manner. The resolution put before us proposes, practically, that we shall do nothing—that is to say, that we shall quietly let the bill alone, should it be reintroduced next session. The amendment proposes a course which, I think, is more in accordance with the views of a large number of shareholders. It is that we shall express our concurrence in the opinions entertained by our worthy secretary, and adopted by the committee of the House of Commons. I think, after the evidence given by Mr. Livesey, the plain, practical, common-sense course for us to take is to adopt the amendment. As regards the past, we have every reason to be satisfied with the able manner in which our directors have conducted the affairs of the company; but, looking to the future, I think it will soon become a question whether one or two more gentlemen should not be appointed on the board to represent our interests. I am aware that this is not the time to make a motion on the subject; I merely throw out the suggestion for consideration. There is another matter to which I may refer. I understand it is intended to bring in a bill next session for making a new railway, which will virtually take away our canal, and, if that bill should really come before Parliament, there will be plenty of work for our directors to attend to; and I submit that it would be advantageous that we should increase their number.

Mr. PRIDDEN: I think the proposition in the amendment, that we should go before the Board of Trade (which is virtually the same as if we went before a committee of the House of Commons), to tell them that we gladly accept the Metropolis Gas Bill of last session, is hardly one that we can properly adopt. That was a bill brought in antagonistic to our interests, and intended to be forced upon us. I am sure that a negative position in reference to it will be more dignified and creditable than to push ourselves forward and say that we are ready to accept it. The authorities might get it into their heads that we should be equally desirous to have it if the initial price were fixed at 3s. 3d. in our own case. With respect to the proposal to introduce a bill of our own, containing provisions for creating new capital, I understand that we have still £130,000, share and loan together, uncalled; and, it is doubtful how far Parliament would be willing to listen to us, and I cannot see that we are in a position to ask for an addition to our capital at present. I dwell more than some of my brother shareholders on the point, that by-and-by we must be bought up by the Metropolitan Board, or some other public authority, and it is my anxiety that whenever a transfer takes place, we should get the highest return possible for our undertaking. I, therefore, strongly recommend, notwithstanding all that has been said to the contrary, a policy of inaction—neither to move with a new bill ourselves in Parliament, nor to write to the Board of Trade stating that we are desirous the bill of last session should pass. It is quite enough for us, should that bill be reintroduced, to watch its progress, and take care that such alterations only are made in it as are in harmony with the well-being of the company.

The amendment was then put to the vote, and carried by a large majority. On being put as the original motion, it was carried *nem. dis.*

The SECRETARY (in reply to Mr. Jenkins) said that 538 proxies had been received in favour of the policy of the motion just adopted, and only 22 votes in favour of opposing the Metropolis Gas Bill.

On the motion Mr. MAY, seconded by Mr. ROSTRON, a vote of thanks was given to the chairman and directors; and the CHAIRMAN having briefly acknowledged the same, the proceedings terminated.

ODESSA WATER-WORKS COMPANY, LIMITED.

The Half-Yearly General Meeting of Shareholders was held on the 19th ult., at the Terminus Hotel, Cannon Street, London—ARTHUR TEMPLE FELIX CLAY, Esq., in the chair, when the following report was presented:—

In accordance with the promise made at the ordinary general meeting of April 9 last, the directors take the earliest possible opportunity of submitting the *ad interim* accounts for the half year ending June 30.

Owing, no doubt, in some measure to the wet season and the depressed state of trade, the general receipts have not increased so rapidly as anticipated, and up to June 30 only about a quarter of the entire number of houses in Odessa and the neighbourhood were supplied by the company. The requirements for shipping, gardens, and trade purposes have been similarly disappointing.

The expenditure, on the other hand, has not as yet materially decreased. This is in great measure due to its having been found impossible by the company's managing director at Odessa, Mr. Michell, to effect any great changes until he had been some few months at his post. On the 1st of May last, however, important alterations were made in the staff and management at Odessa, by which he hopes to effect a considerable saving.

During the half year the supply of water has been fully efficient, and the company's relations with the municipal authorities of Odessa continue to be amicable.

It will be seen that no credit is taken for the contribution due by the municipality of Odessa under the guarantee; as, until the accounts for the whole year are completed, the amount to be paid in addition to that owing for last year cannot be ascertained.

The CHAIRMAN, in moving the adoption of the report, said that the accounts for the half year would not give them so favourable an idea of their actual position as those would of the whole year's working. The result of the whole year would give them a much sounder and clearer view of the state of affairs than those for the past half year. They had elected two new directors in place of those who had resigned, and they held both classes of shares. Mr. Schwaben, having without permission absented himself from the meetings of the board for a period exceeding six months, had ceased to be a director, and the board did not think it desirable to fill up the vacancy for the present. A claim had been made by Mr. Schwaben, on the part of the contractor, for the nominal amount of £70,000 for extra works beyond the amount of the contract, which the directors did not admit. The expenditure had been heavy during the half year, which would be subject to some modifications. Mr. Michell, the managing director at Odessa, only came into office on the 1st of January last, and it required more time to make proper reductions in the expenditure. He had made certain reductions up to the 1st of May last, and he considered that further savings could be effected in addition to those already made. It was impossible to give details, but a large portion of that expenditure would not recur again. The directors had had great difficulties to encounter, and were harassed on every side, but the next half year he hoped would show a different result. They had been suffering from depression of trade for two years at Odessa, but building operations were now going on, and a new opera house was being built. There was no fresh water in the town but what the company supplied, except the rain water. The capital which had been used in the corn trade would now be devoted to other purposes, and Odessa become a manufacturing centre. Several new houses had been built in various directions, and between 600 and 700 customers had been added to their list, which gave them hopes for the future. Things were going on more satisfactorily every day. The receipts were steadily progressing, and every effort was made to reduce expenditure.

Mr. R. BARCLAY seconded the resolution for the adoption of the report.

Mr. BARNES wished to know the cause of the resignation of the two directors, and wished the report of the manager to be read.

Mr. OXENHAM said the expenses were too large both in London and Odessa, and that the new directors should have been elected by the shareholders.

Mr. BAYNARD wished to know whether the dispute with the contractor would be tried in the Russian or English courts.

Mr. BRODIE complained that the receipts for revenue were small, and that £80,000 was paid for the concession. It did not appear that they received any part of the guarantee of £45,000 a year.

Sir F. S. HEAD, one of the new directors, said that he and Mr. Wood were elected to fill the vacancies at the board. The first thing was to have an energetic, united, and honest board. He believed that the board were honestly endeavouring to put the concern into a profitable state, and he would give them his support and assistance. He hoped the shareholders would have confidence in the board, and give them time to do what was necessary for the company. They should not press for particulars about matters in dispute, but leave the board to deal with them properly.

The CHAIRMAN replied to various observations. He said the manager's report was satisfactory on the whole, but it dealt with other matters which they could not, for the interests of the company, make public at present. The directors who had resigned did so to make room for the election of new directors; one retired from ill-health, but both retained their original holding in the company. He quite agreed with the principles laid down by Mr. Oxenham. The engineer of the company agreed with the board in the view they held with regard to the extras. An English court would decide the dispute if necessary. Mr. Brodie compared the receipts of the past half year with those of 13 months in the preceding year. The company had conferred an enormous boon on Odessa, which did not as yet seem to be appreciated by the municipality. There was no hitch with regard to the guarantee of £45,000 a year.

The report was adopted, and the proceedings concluded with a vote of thanks to the chairman and directors for the manner in which they had conducted the difficult business of the company.

ABERDEEN CORPORATION GAS SUPPLY.

At the Meeting of the Corporation of Aberdeen on Wednesday, Oct. 27—the LORD PROVOST presiding—the gas accounts for the year ending Sept. 30 were presented. The revenue and expenditure were as follows:—

Revenue and Expenditure.

Dr.				*Cr.*		
Manufacture of gas	£31,879	2	2	Gas and meter rents	£40,426	16	1½
Distribution of gas	1,458	12	3½	By residual products—			
Rents, rates, and taxes	1,156	17	5	Coke	673	8	4
Management	878	19	2½	Tar and ammoniacal liquor	2,817	10	9½
Discounts on gas and bad debts	1,011	11	6½	By transfer fees	9	10	0
Amount transferred to depreciation, including £650 to contingent-fund	1,175	12	7½				
	£37,283	16	11				
Balance carried to net revenue account, to meet annuities and interest	6,643	8	4				
	£43,927	5	3		£43,927	5	3

Net Revenue Account.

Paid half-yearly annuities, due Feb. 1 and Aug. 1, 1875, less income-tax	£6,367	16	4	Balance from revenue and expenditure account, being profit for the year to Sept. 30, 1875	£6,643	8	4
Less proportion thereof, from Aug. 1 to Sept. 30, 1874, set aside last year	1,074	5	10	Balance (being deficiency) carried to next year's account	1,291	17	7
	£5,293	10	6				
Proportion of annuities from Aug. 1 to Sept. 30, 1875	1,056	10	0				
Paid interest on mortgages, temporary loans, &c.	964	3	9				
Amount carried to sinking-fund, as required by sec. 122 of the Aberdeen Municipality Extension Act, 1871, being 2 per cent., on £20,000 borrowed on mortgage	400	0	0				
Balance from last year's account	221	1	8				
	£7,935	5	11		£7,935	5	11

The estimates laid before the committee for the current year showed a balance in favour of revenue of £526 5s. 9d.

The committee having examined the said estimates, resolved to recommend that for the year from May, 1875, to May, 1876, the Town Council should fix the rates, rents, and sums to be charged by them for gas and for the letting of meters as follows:—

1. The price of gas to all consumers, other than for the city public lamps, to be—

(*a.*) At the rate of 5s. per 1000 cubic feet for the period from May to December, 1875, subject to the following discounts on such accounts as are settled not later than Jan. 31, 1876.

Where the annual consumpt is—

65,000 and under 100,000 cubic feet, discount. 2d. per 1000 cubic feet.
100,000 and under 1,000,000 . . . . . 4d. „ „
1,000,000 and upwards . . . . . 5d. „ „

(*b.*) At the rate of 4s. 10d. per 1000 cubic feet for the period from December, 1875, to May, 1876, subject to the following discounts on such accounts as are settled not later than June 30, 1876.

Where the annual consumpt is—

65,000 and under 100,000 cubic feet, discount. 2d. per 1000 cubic feet.
100,000 and under 1,000,000 . . . . . 3d. „ „
1,000,000 and upwards . . . . . 4d. „ „

2. The price of gas for the city public lamps to be 4s. 8d. per 1000 cubic feet for the period from May to December, 1875, and 4s. 6d. for the period from December, 1875, to May, 1876, without any discounts.

3. The rents for meters to be at the following rates:—

Size No. 0	1s. per ann.	Size No. 5	10s. per ann.
„ 1	2s. „	„ 6	15s. „
„ 2	3s. „	„ 7	20s. „
„ 3	4s. „	„ 8	25s. „
„ 4	5s. „		

For less than 4000 cubic feet of gas consumed half yearly, the rent to be 1s. per annum for Nos. 0 and 1.

The report was approved by the council, and the rates fixed accordingly.

POLLUTION AND PURIFICATION OF RIVERS.

By M. A. GÉRARDIN.

[An Essay to which the Prize was awarded by the Paris Academy of Science in 1874.]

The estimation of the amount of oxygen held in solution* adds a third to the two methods already known as available for determining the degree of pollution of any stream. These methods are—

1. By observing green plants and aquatic molluscs.
2. By microscopically examining *algæ* and *infusoria*.
3. By the amount of oxygen held in solution.

I have sought to ascertain whether these three methods agree, and I have taken the river Vesle from Reims to Braisne as my field of observation. I have gone over the banks of the Vesle by Cormontreuil, Fléchambault, St. Brice, Macau, Compensé, Muizon, Tuilerie, Jonchery, Fismes, Bazoches, and Braisne—that is to say, for a distance of about 60 kilomètres (37½ miles), the first time in April, 1873, when the water was very high; a second time in August of the same year.

The flow of the Vesle never exceeds 6 to 8 cubic mètres (1320 to 1760 gallons) per second. In summer it as low as 0·6 or even 0·2 mètre. The daily flow of the Reims sewers is 19,000 cubic mètres (5,180,000 gallons.)

According to the analysis of Messrs. Maridort and Mangon, the average composition of the waters of the sewers is the following:—

Organic matter	0·833	kilos.	per cubic mètre.
Mineral matter	0·907	„	„ „
Total	1·740	„	„ „

Of this 0·940 is in suspension, and 0·800 in solution.

According to this composition about 30,000 kilogrammes (66,000 lbs.) of impurity, of which 15,000 kilogrammes are solid deposit, each day pollute the Vesle.

The river Vesle has a very slight fall, the force of which is checked by the dams of numerous manufactories established on its course. Below Reims it flows over marshy ground, and almost on a level with the swamp which forms its banks. It is not embanked anywhere. At Cormontreuil, above Reims, the Vesle is clear; it flows upon a bed of sand and limestone. There is very little mud. Fish live there in the midst of *charas*, watercress, iris, &c. Cray fish, *Cypris faba*, are plentiful. The water is certainly wholesome; but I never found shells or trace of mollusc spawn upon the water-plants. I do not know to what cause to attribute this absence of shellfish.

The temperature of the water varies from 10° to 11° Centigrade, and the barometrical pressure varied between 75 and 76 centimètres (about 29 to 30 inches) during my first visit. The test of the water from Cormontreuil to Fléchambault by hyposulphite of soda gives 11 cubic centimètres of oxygen per litre. At Fléchambault, a suburb of Reims, an arm of the Vesle passes by some dye-works. The waters become coloured, and the fish disappear. It is the same with watercress and *charas*. Upon the banks are found tufts of *Sparganium simplex*.

From Fléchambault to the gates of Paris the oxygen held in solution diminishes. It decreases from 11 to 9 cubic centimètres per litre. This decrease is very regular, in proportion to the distance.

Between the gates of Paris and St. Brice, the Vesle receives the flow of the five principal sewers of Reims. There is scarcely any vegetation at the mouths of the sewers, but it becomes very active when the sewer water is diluted by the waters of the Vesle, confirming previous observations on the waters of the Seine.

At St. Charles the sewer water is dealt with as follows:—The water is run from the sewer on to a flat, well-beaten floor, exposing a total surface of 8316 square mètres, on which straw has been spread; water running slowly and in a shallow stream over the straw, which is retained in its place by posts, deposits on it organic matters which it holds in suspension. An active fermentation takes place, and the straw becomes a very valuable manure for vines, but not of much value for other plants.

Miscroscopical examination shows that a very considerable quantity of *Beggiatoa alba* and of *Oscillaria natans* is developed there. This treatment does not perceptibly improve the sewer water. At the exit as well as at the entrance these waters are incapable of becoming charged with oxygen held in solution. These works, made in 1852, have since 1861 been almost entirely abandoned.

At St. Brice the water of the Vesle is thoroughly polluted. The *Beggiatoa alba* grows there abundantly. The sun hastens its decomposition. The *Oscillaria natans* springs up from the bottom of the river, and covers the whole surface of the sluggish water with a thick blackish coat. At first sight this coat seems solid. Animals have often rushed on it mistaking it for firm ground. Sometimes strangers travelling have been victims to the same mistake. At the outlet of St. Brice, the quantity of oxygen held in solution in a litre of the Vesle water does not reach one cubic centimètre; in several places there is none. From St. Brice, turf pits and private enclosures prevent us following the banks of the Vesle. I was only able to rejoin the Vesle six kilomètres further on by road. At the mill at Macau, *Beggiatoa* and *Oscillaria natans* have nearly disappeared; the bed of the Vesle is covered with long whitish *algæ*, called *hypheothrix*.

Above the mill of Macau, the water holds in solution 7·4 cubic centimètres of oxygen per litre. The river turns a turbine at the mill, and by the agitation a great quantity of gas is set free. At the time of my visit, copper under its influence was not much discoloured, although at times copper, and more especially silver articles, were rapidly discoloured. On leaving the turbine the quantity of oxygen held in solution rises to 10 cubic centimètres per litre, but this quantity rapidly diminishes; it only stands at 8·5 cubic centimètres at the extremity of the mill garden.

At Compensé Mill the banks are clothed with the rank vegetation of *Sparganium simplex; hypheothrix* has there almost completely disappeared. Above and below the water-wheel the standard of oxygen in solution is 8 cubic centimetres per litre. The same vegetation occurs at Muizon; *hypheothrix* has entirely disappeared. In weirs, and in all places where the water is a little stagnant, green *algæ* exist, forming a transparent jelly in the water; these are *spirogyra*. At Muizon the Vesle gives 8 cubic centimètres of oxygen per litre. At four kilomètres beyond Muizon the Vesle passes through the beautiful and grand estate of the Tuilerie. At Tuilerie I only found 7·2 cubic centimètres per litre, although I often repeated the experiment to be certain as to the result. From St. Brice, where I found the minimum 0·5 cubic centimètres, the standard of oxygen in solution was always on the increase. But there is no possible doubt the standard is lower one cubic centimètre per litre between Muizon and Tuilerie. Between Tuilerie and Jonchery the decrease in the proportion of oxygen in solution shows itself more and more distinctly. Above Jonchery Mill the oxygen in solution decreases to 4·6 cubic centimètres, and even at the mill dam to 4·2. Below the mill the standard rises to 5 cubic centimètres per litre in the open stream; *spirogyra* are very abundant. Notwithstanding the clearness of the water, the occupants of the mill complain much of the river; they declare it is worse than either at Compensé or at Muizon Mills. The test by oxygen held in solution justifies these complaints. At Fismes, upon the right bank, the Vesle shows 6·44 to 7 cubic centimètres of oxygen per litre. The manufactories upon the left bank produce little change in the composition of the water there. Vegetation is very abundant there, though less so than at Tuilerie and Jonchery. The *chara* tribe and *iris* reappear, as also do lilies. In the meadows through which the Vesle runs to Fismes, below the mills, frogs are very abundant, while there is a complete absence of molluscs on all submerged weeds. Four kilomètres (two miles and a half) below Fismes is the Mill of Bazoches. From the weir of this mill the Vesle returns again to the same condition in which it was before it reached Reims. Fish and cray fish are abundant there; watercress grows; *spirogyra* are not abundant. Above the weir of Bazoches the water shows 8 cubic centimètres of oxygen per litre; below, 10·5 cubic centimètres. Finally, at Braisne, all trace of pollution has disappeared. The Vesle gives 11 cubic centimètres of oxygen per litre, which condition continues up to the discharge of the Vesle into the Aisne.

After having gone over the banks of the Vesle when the waters were very high, it was interesting to re-examine them after a season of drought and heat. In August, 1873, I repeated my visit, stopping at the same places. The temperature of the water was 18° C., and the barometrical pressure varied between 76 and 77 centimètres of mercury (about 30 inches). Vegetation was not changed, and was found in the same places as in April. *Beggiatoa alba* and *Ossillaria natans* prevailed between the Reims sewers and the mill at Macau; *hypheothrix* between the Macau Mill and Muizon; *spirogyra* were less abundant than in April; they are specially abundant from Muizon as far as Fismes. No molluscs to be found on the weeds. The effects of pollution were more powerful than in April. At the mills of Macau and Jonchery, copper and silver became rapidly discoloured. The oxygen showed a marked diminution. At Cormontreuil I found 8 cubic centimètres of oxygen per litre; at Fléchambault 7 cubic centimètres. At St. Charles and at St. Brice the dissolved oxygen had absolutely disappeared. At Macau Mill the standard rose to 1·5 cubic centimètres. There were 2 cubic centimètres of oxygen per litre at Compensé and Muizon Mills. Below Tuilerie the standard went down to 1·6 cubic centimètres; at Jonchery it fell to 1·2 cubic centimètres; but on approaching Fismes it rose; and from 2·3 cubic centimètres above the mills at Fismes, it rose to 3·7 cubic centimètres below. At Bazoches the standard was 6·4 cubic centimètres above, and 7·5 cubic centimètres below the weir. Finally, at Braisne, the standard rose to 8·2 cubic centimètres of oxygen per litre.

The Vesle presents a good field for observation, and great confidence may be placed in the result of the observations, as it receives no considerable tributary in all its course (only the Ardre, which falls into it above the Mill of Bazoches). Its flow being somewhat large, and several mills occurring in its course, the mass of water is fairly homogeneous, and the analyses are well suitable for comparison. The following table gives the result of the analyses:—

Oxygen held in Solution in a Litre of the River Vesle Water at Different Points in its Course.

Stations.	Date of Obsevations. April, 1873. Cubic Centimètres.	Aug., 1873. Cubic Centimètres.
At Cormontreuil	11·0	8·0
Below Fléchambault	9·0	7·0
At St. Brice, below the Reims sewers	0·5	0·0
Mill at Macau, above	7·4	1·5
Do. do. below	8·5	1·7
Mill at Compensé	8·0	2·0
Muizon	8·0	2·0
Tuilerie	7·2	1·6
Jonchery, above the mill	4·6	1·2
Do. below the mill	5·0	1·4
Fismes, above the mill	6·4	2·3
Do. below the mill	7·0	3·7
Bazoches, above the mill	8·0	6·4
Do. below the mill	10·5	7·5
Braisne	11·0	8·2

It is very evident that the natural improvement of the Vesle extends as far as Muizon. From this point the improvement ceases, and the pollution goes on increasing as far as Jonchery, where the minimum of oxygen is observed. From Jonchery the improvement takes place progressively, and at Braisne the Vesle returns to its normal condition. The oxygen held in solution first increases, and it decreases and increases again, passing thus from the maximum to the minimum. Almost in proportion as the quantity of water which these deliquescent substances absorb, as Desains has demonstrated. This phenomenon may be ascribed to three causes:—

1. The silting of the Vesle is so rapid that frequent dredging is necessary from St. Brice to Muizon; from thence, all the detritus from the sewer having been deposited, dredging is rarely resorted to. At Jonchery it is never done.

2. The *algæ*, characteristic of polluted water, can no longer live in these purer waters; they perish, and their *débris* produces another change in the water.

3. The abundant vegetation in the naturally purified waters of the Vesle makes a great quantity of detritus, the decomposition of which pollutes the water. Microscopic examination of the *algæ* shows that the Vesle passes through the state of pollution characterized by *Beggiatoa alba* and *Oscillaria natans*; its improvement is first marked by *hypheothrix*, and then *spirogyra*. The facts are absolutely analogous to those I observed on the streams of St. Denis. I believe they are always produced, whatever may be the cause of the pollution and change in the condition of a river.

Berthollet's maximum was, "When an experiment is to be made it must have an object and be based on an hypothesis."

My object is the purification of the rivers of St. Denis. My hypothesis, which I was not able completely to demonstrate in 1868, was this: organic matters in the course of decomposition are essentially oxidizable. By taking up the oxygen in the water, they render life impossible for beings of a higher organization; they reduce the sulphates, transform them into sulphites, and are the cause of the emanations of sulphuretted hydrogen, the more abundant in the basin of St. Denis, inasmuch as, the earth containing gypsum, the waters are naturally selenitic. If, therefore, instead of leaving waters from manufactories to putrid fermentation in deep ditches of deposit, with a small surface, they are spread out, so as to expose a large surface to the oxidizing influence of the air, the organic matters are completely oxidized, and we are thus able to run them into the streams without producing the unquestionable evils they would otherwise cause. In support of this hypothesis, it will be remembered that at the Universal Exhibition of 1867, the water from the marine aquarium was made to fall in a cascade, and was again pumped back into the aquarium. In the same manner, before the establishment of railways, the fishermen of the Vosges carried live trout all over France, by putting them in boxes, the water of which was constantly agitated by a float-wheel set in motion by a band worked by the axle of one of the carraige-wheels. Practically, by the agitation of the air, water readily takes up oxygen, as the following results, very carefully obtained, prove:—

* Usually in this country termed "free oxygen."

Variations in the Quantity of Oxygen dissolved in one Litre of Water before and after its Fall in a Cascade.

	Cubic Centimètres.
Dec. 26, 1872, Bois de Boulogne—	
Canal above the grand cascade	9·66
Grand cascade on the rock where the water falls	10·70
Nov. 10, 1872, Chantilly—	
Above the weir of the great lake	8·96
Below the weir	10·20
Oct. 3, 1872, Gonesse—	
Artesian wells as it issues from the tube	2·40
Artesian wells after a fall of a mètre	4·10
Nov. 21, 1872, Aubervilliers—	
As it issues from M. Maricot's well	3·00
As it issues at the surface of the reservoir	3·25

The aëration of water and the oxidation of dissolved organic matter should cost nothing, and be automatic and independent of the neglect of workmen. To settle this problem I see only one possible way. The waters must be broadly spread upon land previously drained. To spread the water upon land has long since been tried. M. Dailly was, I believe, the first who suggested it for waters of factories. Joining example with precept, M. Dailly spread over his lands the waters from his starch factory at Trappes (Seine-et-Oise), and found that these waters acted as manure. Space is not wanting at Trappes; four hectares (nine acres) of land received the waters of the starch factory, where they only worked 200 setiers of potatoes daily. M. Dailly obtained good results. The result, however, is not the same where space is limited. Thus, in a starch factory at Colombes (Seine). the waters are run on to a meadow, where they soak into an especially sandy soil. As soon as they reach the grass, it dies and becomes black, as if carbonized by fire. By accident they let the waters reach some large trees, and they perished quickly. The waters soak in slowly, give out a very disagreeable odour, and the soil becomes rapidly clogged; it is necessary to change the place of absorption at least twice a week. The infiltrated water passes through the sand, reaching wells very far distant from the factory and completely polluting their waters. The water from the starch factory is not improved by its underground passage; on the contrary, it becomes much more polluted than when first absorbed.

At Louvres (Seine-et-Oise) similar effects are produced. The waters of a starch factory, which were prohibited passing by Goussainville to the cress-beds of Gonesse, were run into an abandoned quarry and left to chance. During two seasons all went on well; but the third year, these waters, in a state of complete pollution, made their way to some mushroom-beds. All the mushrooms died, and their cultivation had to be given up. At Herblay, Villette, Aux-Aulmes, Trembley, where the waters from starch factories were spread on the soil, the water became rapidly clogged, and the infiltrated waters were abominable. It is for this reason that blind wells are impracticable. There is, therefore, some addition needed to M. Dailly's process to obviate these serious evils. For this purpose I have proposed draining the land on which the operation is to be carried out. Drainage is indispensable, as well from a mechanical as from a chemical point of view. In fact, by draining we allow a free flow to the water; it is carried where we wish, and we preserve uninjured subterraneous sheets of water and the neighbouring properties. Moreover, drainage is a process of energetic oxidation, as shown by M. Chevreul; it enables us to oxidize without expense dissolved organic matter, and prevent their putrid fermentation. I believe I am the first to have utilized these drainage works for the purification of water from factories. Since my first experiments on this subject in 1868, the employment of artificial subsoil drainage in the agricultural utilization of sewage waters has much extended.

In England, Mr. Bailey Denton has executed great works of purification, rendering these waters wholesome by a method which he calls "Plan of Intermittent Filtration." He has applied his method at Merthyr Tydvil, in Glamorganshire, a manufacturing town of 100,000 inhabitants, where all the water from factories and houses is treated by intermittent filtration.

To decide the question of priority, it must be remembered that my first communication on this subject was on the 29th of November, 1869, M. Dumas having then been kind enough to present to the *Académie des Sciences* a memorandum which I had addressed to him on the purification of factory waters by applying them to drained land. This memorandum, inserted in the *Comptes Rendus*, fixes the date of my experiments with exactness. Without going further into the question of priority, I will continue my statement.

The examination of the river Croult has proved to me that the starch factory of Messrs. Boisseau, Bonnevie, and Lucy, at Gonesse, situated high up the river, was the first cause of the change and pollution of the water of this river; indeed, starting from this factory, green plants, fish, and molluscs disappear, and *Beggiatoa alba* appears. This factory can work up daily the produce of 400 hectolitres (1100 bushels) of potatoes, representing 28,000 kilogrammes (63,000 lbs.) in weight, furnishing 7000 kilogrammes (15,000 lbs.) of starch, and 21,000 kilogrammes of liquor carried into the river. The quantity of water required for this factory is 130,000 litres (2860 gallons) daily, which is thus divided:—

	Litres.	
Water necessary for rasping	100,000	
Water for cleansing and washing	30,000	
Total	130,000	(28,600 galls.)

The total quantity of water sent daily into the Croult after remaining in the large ditches is:—

	Litres.	
Liquor from the potatoes	21,000	
Water for manufacturing	130,000	
Total	151,000	(33,000 galls.)

By the side of the factory, upon the banks of the river, there are 2000 square mètres (half an acre) of land. This land is clayey, and at a depth of 60 centimètres (2 feet) is found a subterraneous sheet of water. It is on this field that we tried purification by oxidation. In distributing 151,000 litres of substance upon 2000 square mètres, each square mètre should receive 75 litres of liquid for oxidizing 10½ litres of potato pulp for each working day. The season lasts 200 days at most. Each square mètre should then absorb or oxidize in a season $200 \times 75 = 15{,}000$ litres, which is made up thus:—

	Litres.	
Water in manufacture absorbs	12,900	
Pulp to be oxidized	2,100	
Total	15,000	(3300 galls.)

Is it possible to make a drained soil absorb 75 litres of square mètre in 24 hours, and to oxidize 10 litres of potato pulp in the same time? This question M. Boisseau and I put to ourselves from the beginning of 1869, having undertaken the drainage works for the following season. We found no solution to our question, notwithstanding having consulted numerous works and questioned cultivators who understood drainage. In absence of all information from former experience, we undertook to experiment ourselves. The land taken for our experiments was of a rectangular form. We divided it into two equal parts by a ditch at right angles to the Croult. This ditch, which served as a strainer, is divided at the extremity of the river into two branches in the shape of a T. At the two ends of these branches are the sewers for taking the strained water to the river. The drains were placed at two mètres (6½ feet) distance from each other, and at a depth of 35 centimètres (12 inches). They are earthenware pipes, 8 centimètres (3 inches) in diameter. In August, 1869, we tried the working of the plan. In a few days we were able to arrive at the following facts:—

1. The absorption of the water was complete; it was even too rapid. It was impossible to irrigate all the land in one day. A square mètre of land drained in the above manner can absorb much more than 75 litres (16½ gallons) of water.

2. The process is efficacious. When the drains slowly discharge the water of the starch factory, the water loses its red colour; it is almost discolorized. On the river the scum has diminished. Green weeds do not die in the Croult below the factory. We therefore persevered in this method of improvement. M. Boisseau stopped the work at the factory, and lowered the drains to 55 centimètres (22 inches) in depth. He set up a wooden trough, raised above the soil with a very slight fall, receiving all the waters from the factory. In this trough he made at certain distances small openings. In passing through these openings water flows in small threads, and falls into movable gutters, formed of zinc plate slightly concave, placed end to end. To change the distribution of water, it is only necessary to move these gutters. Their length and direction may be easily varied, and the water can be distributed equally over the land. Since this process of purification has been employed at Gonesse, M. Boisseau has each year increased his manufacture, as shown by the following return:—

Return of Manufacture at the Starch Factory.

Years.	Potatoes Received.	Produced.		Water used for Manufacturing.	Total Amount of Liquid Distribution on the land.	Total Quantity of Liquids received per Square Mètre during the Season.
		Starch, &c.	Liquor.			
	Tons.	Tons.	Tons.	Tons.	Cubic Mètres.*	Cubic Mètres.
1868–1869	1,800	—	—	—	—	—
1869–1870	2,233	548·6	1,684·4	11,165	128,449·4	6,425
1870–1871	Stoppage	—	—	—	—	—
1871–1872	2,900	587·6	1,312·4	14,500	16,812·0	8,406
1872–1873	4,500	911·8	3,588·2	22,500	26,088·2	13,044

* A cubic mètre is 220 gallons.

For the current year, 1873-74, the quantity of potatoes is increased to about 6000 tons. Each square mètre of land will receive during this season from 17 to 18 cubic mètres of liquid. There was reason to fear so large a quantity of potato pulp would pollute the ground and bring on saturation. Experience had shown that these fears were groundless. The land has remained in good order, perfectly healthy, and its fertility is very great. From the time the starch-works were stopped it has been cultivated. It is impossible to give even an approximate idea of the value of the produce, because M. Boisseau, to excite emulation in his workmen, has divided the land into plots which he lets them occupy gratuitously. Each person cultivates as he likes. The workmen having recognized that the water from the starch-works, in the state in which it came to them, gave an excellent manure, quarrelled for the water to such a degree that M. Boisseau interfered, and regulated the quantity of water to be allowed for each plot. On this land they cultivate all kinds of kitchen herbs, peas, beans, onions, turnips, and carrots, giving very good crops. The yield of artichokes in 1872 was remarkable. At the time of recommencing work again at the starch factory, the end of August, artichokes were in full growth. Upon the land which they occupied we had distributed the water from the factory. After having seen at Colombes grass burnt up by the water from the starch-works, we thought that the artichoke, a very tender plant, could not bear the trial we had given it. Nothing occurred; all the artichokes survived. Thanks to the mildness of the season, we were able to gather them up to February. Land treated with these waters does not suit potatoes. Each year we planted several beds; they produced stalks 1·45 mètres (4 feet 6 inches) long, and tubers of bad quality and small in quantity. The results of these experiments show that the waters from starch-works may produce two very different effects. When they first leave the factory before complete fermentation, they are inodorous, and quite harmless for vegetables, for which they are used. If, on the contrary, they are kept in ditches for settlement, they soon stink, and destroy all vegetation. These two conditions succeed each other in the course of a few hours. In my opinion starch makers should be very careful not to allow their waters to stagnate. They should endeavour to make them run in somewhat thin sheets. This precaution has the effect of facilitating the deposit of the starch, and of bringing on oxidation by the air. We recognize that the waters are properly treated when they become rapidly coloured by the oxidizing action of the air. The deeper the colour, the more readily purifying action takes place in filtering through the soil. Putrifying waters are whitish, opaline, and scarcely improve by filtration. At the mouths of the drains, the water from the strainer runs into the ditch which was made in the middle of the ground. I formed a ditch, and not a collecting drain, to increase the oxidation of the air; at the end of the ditch the water falls in a cascade into the Croult. It is almost entirely colourless, but slightly amber coloured, without odour, and the taste is not unpleasant. After having received the drained water from the starch factory the Croult bears on its surface some white foam, but exhibits none of the putrid marks of pollution which previously called forth such just complaints. On the 23rd of April, 1870, the first season was finished, during which the water from the starch factory at Gonesse had been purified. M. Lelièvre, member of the Municipal Council of St. Denis, and myself, went over the banks of the river to take note of the results obtained. There was a great change from preceding years. No complaints were made to us; on the contrary, all the dwellers near the river whom we questioned congratulated themselves on its improvement. In fact, *Beggiatoa* and *Oscillaria natans* had not made their appearance; thousands of fishes were hatched in the river where scarcely even black leeches had been found for several years. Instead of black and polluted mud, a bottom of white sand in many places was to be seen. Water plants began to appear, and in the garden of the cardboard factory of the Messrs. Cohen, at Févon Mill, Commune de Courneuve, we found in the Croult watercress plants. We gathered some of this cress, and offered it to M. Giot, mayor of St. Denis, to show that the purification of the Croult, which he had been seeking for many years, had at last been effected.

Several other factories exist on the Croult which affect its purity. At Gonesse, below the starch factory, there are dye and large sugar works. The dye-works colour the water, but the colour is not long in being precipitated. In my opinion it only soils the river, without producing pollution. The sugar-works affect to a greater extent the purity of the Croult. They produce what all similar factories do in the river where they discharge their water; they generate *hypheothrix* identical to that I described at Vesle, and at the Macau and Compensé Mills. I find that *hypheothrix* succeeds *beggiatoa* when the water is improved, and precedes *spirogyra*, the forerunner of perfect purification.*

* The water from the sugar-works is now purified by being spread over a drained meadow. Before being run over the meadow the water deposits in ditches earth and small roots which it brings down. The deposit in this ditch is a valuable manure for certain lands.

At Dugny there are dye and starch works; the dye-works specially colour the water of the Rouillon. The starch-works, less important than those at Gonesse, send their waters straight into the Croult, without submitting them to any purification. The Dugny starch-works cause froth again to reappear on the Croult, much deteriorating its quality; but the Croult at Dugny is sufficiently good for the purpose of starch-works, so long as the water does not come down to the Croult in a putrid state of fermentation.

In spite of the flow of discharged water from these four factories, and from the house sewage from Gonesse, Arnouville, Bonneuil, Garges, Dugny, and Courneuve, &c., it is admitted that the state of the Croult at its entry to St. Denis is satisfactory. This fact is attested by a resolution of the St. Denis Municipal Council, dated May 20, 1870. It is daily proved by the absence of complaints and cessation of lawsuits. In visiting the cemetery of the Maison d'Education de la Légion d'Honneur it is seen that a considerable mortality existed at that establishment every year, in the month of June, till 1868. This mortality, attributed by the medical men of the establishment to the disastrous effects of the river, has ceased since the purification of the Croult, and its being stocked with fish, green plants, and molluscs. Since 1869 plants in the Croult grow with a troublesome vigour. If not constantly mowed down, the bed of the river is blocked up, stopping the current and raising the level of the water. In May, 1869, measures had not been taken to check this unexpected growth of plants. The river was obstructed, the level raised, the pressure of water causing a breach in the banks at a place called the Marville Meadows. Several gangs of workmen were employed during the summer in cutting the weeds, and throwing them on the banks. However, it is observed that the abundance of plants diminishes yearly, as if the slime accumulated during a dozen years of pollution, and incompletely removed by cleansing, was wearing itself out. These plants are principally *charas, Myriophyllum*, bastarderess, and often watercress. Such a vigorous vegetation is suitable to the development of molluscs, and they are very abundant in the Croult, the most abundant being: *Physa fontinalis, Cyclas cornea, Limnea ovata, Limnea stagnalis, Valvata piscinalis, Pisidies, Planorbis corneus, Planorbis vortex, Planorbis marginatus*. The principal *crustacea* are cray fish and *Cypris faba*. In several places on the Croult I have made small watercress beds, which indicate to me the quality of the water. If the cress turns yellow, then more precautions are taken at the Gonesse starch and sugar factories, and, if necessary, their working is suspended for some days, so as to allow the drained earth to be well aërated. At different times and places in 1872 and 1873 I tested the oxygen in solution in the Croult by the process of hyposulphite of soda, which M. Schutzenberger and I have published.

Oxygen held in Solution in a Litre of Croult Water.

Stations.	Dates of Observations.						
	1872.		1873.				
	Oct. 3.	Sept. 20.	Jan. 9.	Jan. 15.	Mar. 10.	May 22.	Sep. 2).
	Cubic centimètres.	Cubic centimètres.	Cubic centimètres.	Cubic centimètres.	Cubic centimètres.	Cubic centimètres.	Cubic centimètres.
Gonesse—							
Above starch factory .	7·4	8·0	8·2	8·0	9·0	9·0	9·0
Above sugar-works .	5·2	6·2	6·0	6·0	5·0	6·0	6·0
Below town	3·2	3·0	3·5	4·5	5·0	5·0	5·2
Arnouville . . .	3·5	4·0	4·5	5·0	6·0	5·5	4·6
Garges—							
Above town	4·5	6·3	5·5	5·5	8·0	6·5	7·0
Below town	6·0	8·0	7·0	6·5	9·0	8·0	7·5
Dugny—							
Créte de Palluel Mill	7·2	8·5	8·0	8·5	9·3	8·4	8·6
At "Pierres de Niveau"	5·0	4·5	6·6	6·0	8·6	7·6	8·0
St. Denis—							
Basset Mill	5·0	5·3	7·0	6·2	9·0	9·5	9·0
Choizel Courtyard . .	4·2	4·5	5·0	4·5	6·0	7·0	7·0

The standard of the oxygen held in solution diminishes in going through Gonesse. Leaving Arnouville it rises, and attains its maximum at Dugny, at M. Créte de Palluel's mill, where the Croult receives the Morée, where the standard of the oxygen held in solution varies from 10 to 8 cubic centimètres the litre. A little lower down where the Croult receives the waters from the starch works and dye works of Dugny, its standard again lowers. It rises again between Dugny, and St. Denis. At the entrance to St Denis at Basset Mill, the standard attains a second maximum. The factories below the mill at Basset again lower the standard in going through the park of the Maison de la Légion d'Honneur. Beyond this park the Croult is used by 200 establishments situated on its banks, which have had a right to its waters from time immemorial. It is interesting to notice the sudden effects produced by the influx of a sewer or of an artesian well. The success of my experiments on the purification of the water from the starch factory at Gonesse induced me to repeat the same at the Bourget starch factory. The manufacturers do not agree in my theory of the experiments at Gonesse. The greater part attribute the success to the simple filtration of the water through the earth, and do not admit the necessity of oxidation. M. Antheaume, proprietor of the Bourget starch works, was one of those who thought that filtration through the soil sufficed for purification. He had seen at Gonesse how considerable was the quantity of water the drains could discharge. In his garden he placed drains at 2 mètres (6 feet 8 inches) apart, and 50 centimètres (20 inches) deep, upon a surface of 500 square mètres (595 square yards). This drainage acted during the season of 1871 and 1872. The experiment resulted in the destruction of beautiful fruit trees which were reached by water from the starch works. These waters were not oxidized, but putrified the ground, and caused a frightful stench.

The river Mollette, which received these waters, remained also polluted as before the employment of drainage. During the summer of 1872 M. Antheaume procured 1 hectare (2½ acres) of land at 200 mètres (218 yards) distance, and a higher lever than the factory. They were obliged to use force pumps to send the water into the land through Doulton's earthenware-pipes. The land is of a rectangular form, and situated on the highest part of the hill on which Bourget stands. The soil is sandy and light, easily pervious to water. The Bourget starch factory can, as that at Gonesse, rasp 400 hectolitres (1100 bushels) of potatoes daily. The land used for purification at Bourget being five times larger than that at Gonesse, there was room to give more space for the drains. I placed them 10 mètres (11 yards) distant from each other, and 1 mètre (40 inches) deep; I made them discharge into a strainer, dug in the middle of the field. The water from the starch factory brought by the stoneware pipes is distributed by means of a wooden conduit which surrounds the land. The distribution of the water is the same as at Gonesse. At the beginning of the season of 1872 and 1873 two small accidents caused these experiments to be delayed. The force pump was too weak to pump all the factory water over the land. The earthenware pipe was broken by a heavily laden carriage passing over a cross-road. Time was lost in making these two repairs; the waters were not regularly purified till December, 1872. The improvement of the Mollette was thus delayed two months. I tested the quantity of oxygen held in solution in the Mollette at different times. Before reaching Bourget the Mollette only contains from 5 to 6 cubic centimètres of oxygen per litre, in consequence of the defective state of the dredging, and especially because it frequently receives the sluice-waters from the Bondy sewer.

Oxygen held in Solution in the Litre of the River Mollette Water.

Station.	Date of Observations.				
	October, 1872.	Jan. 9, 1873.	March 10, 1873.	May 22, 1873.	Sept. 20, 1873.
	Cubic centimètres.	Cubic centimètres.	Cubic centimètres.	Cubic centimètres.	Cubic centimètres.
At the point where the Mollette passes above Vieille Mer.	0·00	5·32	8·00	4·8	7·6

The improvement of the river Mollette is unquestionable. *Beggiatoa* have completely disappeared there since December, when the drainage of the starch factory at Bourget commenced. The manufacture of glucose, from which the water is not yet purified, causes the appearance of the *hypheothrix*, the characteristic of moderately impure water, but not reaching putrid fermentation. The experiments at Gonesse and Bourget prove that the waters from starch-works are purified by straining over drained land. The more largely the water is diffused the better is the effect. I advise manufacturers who employ my process, to be careful to let the waters fall drop by drop on the land, and to avoid making streams. Streams or trenches on a drained land effect filtration, but complete oxidation is not produced, and this seems a necessity for purification. If it be simply desired to arrest matters in suspension, water may be distributed by trenches, but if it be wanted to purify water containing dissolved organic matters it is absolutely necessary to employ the process established at Gonesse and at Bourget, spreading the water over the land in thread-like streams by means of troughs. I have made two other experiments, one at Crèvecœur, upon the waters used there for washing and cooking sheep's heads; the other at Aubervilliers, on the waters of the cardboard factory, confirming the accuracy of the practical rule which I have laid down.

River Montford.—The cardboard factory at Aubervilliers is the one which most affects this stream. In the examination which I made of these waters in 1869 I found *Bacterium termo*, showing an urgent necessity for the purification of these waters.

The first works for this purpose were commenced in July, 1870. The war stopped them. They were again begun and finished in 1871. M. Maricot and his sons-in-law and partners, Messrs. Lourdelet and Schaeffer, first tried to reduce the quantity of water which they must get rid of, so they made use of the same water twice over for diluting the pulp, thus leaving only 15 cubic mètres to discharge daily. I had therefore only 15,000 litres (3300 gallons) of water to treat daily; but, as a set off, these waters were charged to saturation. Before the factory there was a large open space; 9000 square mètres (1080 square yards) were at my disposal for the treatment of the waters. I made in this land 15 parallel drains distant 1·50 mètres (5 feet) from each other. The drains were 8 centimètres (3 in.) in diameter, and 60 (2 feet) in depth. Parallel to these drains, and at an equal distance from each consecutive drain, I laid down trenches in the soil periectly levelled, with a slight fall. The water from the cardboard factory was sent into these drains; I could not proceed as at Gonesse and Bourget. The working of the cardboard factory is always going on; the starch-works only during the winter. To distribute the concentrated water from the the cardboard factory on cultivated plants would most probably cause them to perish, besides these waters were extremely thick. Filtration seemed to me more necessary than oxidation. I could not lower the drains more than 60 centimètres (24 inches) because of the level of the stream on leaving the factory; and it was absolutely necessary to avoid having force pumps for raising the water to the level of the mill dam. In England drains are placed beneath the trenches. I prefer making the trenches and drains alternate. By my plan the water has to run further, and the flow is moderated, for it always has a tendency to run too rapidly, and the drain thus directs the liquid towards the roots of the cultivated plants. These roots are very active purifiers. The English method of vertical infiltration does not offer these advantages. When the land of the cardboard factory was thus prepared, and the strainer ditch opened at the outlet of the drains, water was sent into the trenches. The filtration was good, the drains acted regularly for some time, and then they ceased to run. A considerable quantity of cardboard stuff choked up the drains, though this stuff was not to be found in the ground which the water had traversed. In comparing this with similar facts which I have observed in water from starch-works, photographic-works, &c., I can only suggest a doubtful solution of the phenomenon. Cardboard stuff contains a considerable quantity of size from old papers. Whilst these materials are in solution they check the complete precipitation of the tissues; but when they are destroyed by the oxidizing action of drains, the stuff is precipitated and forms by degrees in the drains the deposit found there. It has, therefore, been found necessary to discover a practical way of meeting this. In the yard of the factory there is a watertight tank of masonry. This tank was made by order of the *Conseil d'hygiène et de salubrité* of the department of the Seine, for the waters of this factory to settle. It holds 100 cubic mètres (22,000 gallons). We divided it into two equal parts by a solid wall. When one of these parts is full a hectolitre (2¾ bushels) of slaked lime mixed with water is added. It is stirred up and then left to itself. Whilst this is going on, taking three days for the purpose, the second division is filled. After waiting three days the water in the first division in which the lime has been put is pumped up. This water is clear, of an amber colour when cold, of a green colour when hot, and it is inodorous. At the bottom of the reservoir an abundant deposit is found. This deposit is collected. Analysis shows it to be rich in cardboard stuff. Messrs. Maricot, Lourdelet, and Schaeffer estimate that they recover by this operation 7 per cent. of the raw materials, so that the treatment of the residues largely covers the expense of the purification of the water. The purification of the waters of the cardboard factory by my method causes no sacrifice to the manufacturers who will take the trouble to do it, and the best proof I can give of the fact is that Messrs. Maricot and Co. are perfectly decided to continue the purification of their water, whenever a sewer which is projected is ready to carry it away for them. The water pumped into the reservoir is received into a trench of *Beton Coignet*, which M. Lourdelet has had constructed with the greatest care. On this trench are put 15 small wooden sluices which admit the water into the various channels for distribution where required. The water slowly filters in the ground. After the action of the lime it no longer contains the stuff, but it still holds in solution some fine matters which are precipitated under the influence of air. In examining this microscopically they can be seen agitated by a *brownian* action, of which it exhibits a striking example. These microscopic particles, which are precipitated by the air, form a deposit in each furrow, and from time to time must be removed from the soil to prevent it becoming clogged. Cultivation is evidently necessary to cleanse the earth by removing from it the products brought from the cardboard works. We imagined that few plants could be benefitted by this water, but our apprehensions were unfounded. The workmen planted artichokes, pumpkins, beans, &c., and all grew with an extraordinary vigour. This unexpected result is explained by microscopic examination of the waters of the strainer. In fact, in the strainer ditch, the water turns green, and has a green scum. This green material is nothing but swarms of *euglènes*, nourished by the gelatine from the old paper. On carefully examining the river Vivier from the cardboard factory

to Montfort no more *bacteria* are found. At the very mouths of the drains the waters take up oxygen. From the pool at Audervilliers it holds in solution 2 cubic centimètres of oxygen per litre. The *euglènes*, abundant at the mouths of the drains, give place to *rotifera* and to the *larvæ* of insects. So far, it is true that organic matter nourishes organized beings, and that beings of an inferior organization are replaced by beings of a higher organazion as soon as the improvement has taken place which admits of their living. Upon Montfort stream there is another establishment, well known as contributing to the bad state of its water—namely, M. Artus's factory for treatment of sheep's heads. Water coming from this establishment contains lime, blood, grease, and the refuse of the boiling of the sheep's heads. I undertook the purification of these waters by following the same process as before. M. Artus obtained a piece of land facing his factory, which was part of a market garden. This land was only separated from the factory by the Montfort stream. The earth there is pure *humus*. The drains are placed perpendicularly to Montfort stream, which serves as a strainer.

The factory waters are collected in a water-tight reservoir, and raised by a pump, and carried by means of wooden channels to the extremity of the land. They are spread by means of a trench parallel to the stream and divide themselves by furrows parallel to the drains. These furrows alternate with the drains, following the rule already explained. In spite of this arrangement, the absorption is perhaps a little rapid. I do not advise altering the present arrangement, as the land will, later on, lose some of its filtering qualities. The nëration of the soil by these drains is well done. No trace of putrid fermentation can be found at any depth, notwithstanding that the arrangement has been working more than a year. The drained land is cultivated as a kitchen garden. The factory waters form a capital liquid manure, and never touch the leaves but soak down to the roots. The result is unquestionable; as a further convincing proof, compare the production obtained without trouble by M. Artus with that of neighbouring market gardeners who use a great quantity of manure, and water largely.

In 1868, at the commencement of my researches, the question of purification of factory and household waters engaged the attention of France and other countries. Deposition, filtration, chemical treatment, and agricultural utilization, were proposed. In every case where it was tried, agricultural utilization was more and more approved, whilst often expensive and costly experiments, with other processes of purification, have been found insufficient. During the last few years the necessity for drainage has been admitted for cleansing the waters, carrying them off, and preventing their soaking into the land. According to my opinion, the drainage of land watered by sewage is more useful in a chemical than in a mechanical point of view. This is the essential and fundamental aim of my experiments. Drainage in accordance with my method, being as energetic as it is economical, it is easy now to utilize factory waters and to render them inoffensive, and get rid of those serious evils to which, for so long a time, the researches of *savants* have been directed.

GAS-METERS ON THE PRINCIPLE OF SATURATION.

The following communication on gas-meters with constant water level, based on the employment of a saturating chamber, has been addressed to the editor of *Le Gaz*, by M. Rouget, who contributed a paper on the subject at the last meeting of the Société Technique de l'Industrie du Gaz en France, a translation of which appeared in the JOURNAL on Sept. 14 (p. 403):—

The importance of maintaining the level of the water in gas-meters cannot possibly be doubted. It is one of the questions which very justly occupy the attention of the gas industry, from the double point of view of exact measurement of the gas and of security in the indications of the meter; and since Samuel Clegg, inventors and manufacturers have vied with each other in bringing out the most ingenious mechanical arrangements to obtain that result. In England, France, and Germany the question is always under consideration, and few weeks pass without the appearance of some fresh patent.

Trials have been successively made of special reservoirs, on the principle of the bird fountain, for furnishing an intermittent supply, the mechanical elevation of the water by means of scoops or a small pump, the floating of the drum, the immersion of a special float, and so on. But all these mechanical modifications which have been applied to the arrangement, so simple and so perfect, of the admirable instrument of Clegg, have not been able to withstand prolonged trial, and have all shared the same fate. The persistency of inventors in this direction has only been equalled by their want of success. It is, therefore, beyond these processes that we must look for the realization of the constant water level in meters, and, consequently, the exact measurement of the gas supplied to the consumers.

The system which I have brought under the companies notice since the year 1871 is based upon the employment of a special water reservoir, furnished with divisions, which the gas has to traverse previously to its entrance into the meter. It will be seen at the outset that the arrangement of the present meter is preserved intact; consequently, no doubt whatever need be entertained as to the proper working of the instrument.

But in order to proceed methodically, and ensure clearness of description, I will divide this paper into four parts:—

1. *Description of the Principle of the Meter with Evaporation Chamber.*—The following are the terms in which I described my arrangement of meter on its introduction in the year 1871:—"It is well known that when a vessel containing water is placed in a current of air, the water disappears little by little by evaporation, and this takes place so much more quickly the higher the temperature is, and the drier and more rapid the current of air. If this air were moist, and contained the maximum quantity of vapour it was capable of containing—that is to say, if it were *saturated*—this evaporation would not take place."

It is in this way that, in the wet meter, the stream of gas traversing, it carries away by evaporation a part of the water. The quantity of water absorbed per cubic mètre of gas varies according to the temperature of the meter; but there is always absorption of water, the gas on entering the meter being relatively *dry*, and never *saturated*.

"If, therefore, the gas could be saturated before it entered the meter, it would no longer absorb water in its passage through, and a constant level would be maintained.

"To attain this end, I cause the gas to pass into a special compartment, filled with water, and increase the time during which the gas shall remain in contact with the water by dividing the compartment into channels by means of partitions. I have also taken care that the meter and the water compartment should be of the same temperature.

"What takes place in such a meter? Does the water level really remain constant? Mathematically, no; but practically, yes."

A few days experience easily demonstrates this. The causes of the slight alteration of level, which, however, does not affect the measurement, are readily understood.

The meter with an evaporation chamber is not a saturating meter, as people are inclined to call it. The word "saturation" is altogether improper. A volume of gas is said to be saturated with vapour when it contains a quantity that cannot be augmented by contact with liquid. At this moment the vapour exerts at the surface of its generating liquid a maximum pressure corresponding to its greatest tension in a vacuum. In this particular condition the slightest lowering of the temperature causes the condensation of a portion of the vapour. To each temperature there consequently corresponds a different state of saturation. The tables of the elastic force of vapours in any treatise on physics allow of the calculation of these figures.

Let us now apply these principles to ordinary illuminating gas. At the temperature of 15° C., one cubic mètre of saturated gas contains, according to Regnault, 12·81 grammes of vapour of water. At 12° C. it contains no more than 10·81 grammes. Consequently, a lowering of the temperature by 3° results in a condensation of 2 grammes.

Saturation is a particular case which, as far as gas is concerned, is never realized in practice, as a very prolonged contact with the water is necessary to obtain that result. Now, as the gas passes through the meter with a certain speed, it is evident that it is not saturated on its exit. Nor is it saturated in the course of its passage through a partitioned water reservoir, where its speed is greater; it will simply be brought very near its point of saturation, and, consequently, will carry away only a very small quantity of water.

This accounts for the slight alteration that takes place in the water level, and as that alteration does not affect the measurement to the extent of more than one-quarter per cent. per cubic mètre, it may be regarded as altogether unworthy of consideration.

To recapitulate, the meter furnished with an evaporating chamber is a meter with a constant water level, but is not a saturating meter. The gas issuing from an ordinary meter is not saturated, nor is that which has passed through one constructed with a water reservoir. Experience has given to these propositions all the exactness of a mathematical demonstration.

2. *Practical Results Obtained.*—The gas as it comes from the mains contains a variable quantity of vapour of water; it is relatively dry, and, consequently, far removed from a state of saturation. According to the results of some experiments published in the German gas journal, of which M. Schilling is the director, the quantity of vapour contained in gas may be estimated at 4·5 grammes per cubic mètre on the average, and this figure we have ourselves verified. The gas being at the temperature of the soil, which is about 11° or 12° C., it would be saturated to the extent of 11 grammes only. It would, therefore, have a tendency to evaporate any liquid with which it might come in contact, whether the meter were placed in the even temperature of 12° C. of the subsoil or a cellar, or located in a kitchen where the temperature reached 20° C.

We can, therefore, lay down the principle that evaporation always takes place, for it is unnecessary to take account of the 1 or 2 per cent. of meters that freeze in the winter, these meters being also exposed to very severe temperatures in the spring. This power of evaporation increases considerably with all meters during the spring, in consequence of the increase of temperature acquired by the gas in traversing the leaden pipes, and the meter also possessing a higher temperature than that of the gas. Its point of saturation rises with this temperature; at 17° C., for example, it becomes 14·4 grammes per cubic mètre.

These preliminaries settled, I transcribe below the results obtained at Brest, in the middle of the city, working with the hygrometer, and operating successively upon an ordinary 3-light meter, and upon one of the same capacity furnished with a water reservoir. The temperature of the apartment was invariable at 14° C. The meter worked at the normal speed of the drum, and was in equilibrium of temperature with the air.

Experiment 1.—The gas from the street contained 4 grammes of vapour of water per cubic mètre; after having passed through the meter it contained 11 grammes; it therefore carried away from the meter 7 grammes of water per cubic mètre. The quantity of water carried away by 45 cubic mètres of gas, representing the monthly consumption of a 3-light meter, would therefore be 315 grammes, which would affect the measurement to the extent of 5 per cent. to the detriment of the company.

The outflowing gas in this case was not saturated, since to have been so it would have required 12·2 grammes of vapour per cubic mètre at that temperature. Accordingly, condensation could not take place without a notable cooling of the distribution-pipes, and an altogether special arrangement of the leaden tubing, which would have a temperature very much lower than that of the meter, in a current of cold air, for example, and in a separate apartment from that in which the meter was placed,

Experiment 2.—The same experiment repeated upon a 3-light meter provided with a water reservoir gave the following results:—The inflowing gas contained 4 grammes of vapour per cubic mètre; after having passed through the meter it contained 11·2 grammes. The quantity of water carried away per cubic mètre of gas was 7·2 grammes, its state of saturation corresponding to 12·2 grammes.

The outflowing gas was not, therefore, saturated to a greater extent than in the preceding case nor was it any more liable to condensation under ordinary conditions. As in the case of the ordinary meter, for condensation to take place, a special and exceptional distribution of the lead piping would be necessary, which ought to be left out of the question.

To recapitulate, an ordinary hydraulic meter, or one furnished with a water reservoir, placed in the same apartment (shop or room) as the gas-jets or other burners supplied by it, cannot produce condensation. Both theory and practice agree in demonstrating this. The objection founded on the danger of condensation is, thererfore, untenable; this fear results simply from an erroneous and altogether superficial consideration of the question. However, should any doubts exist after the conclusive experiments above cited, I can remove them by one of the most practical and most conclusive demonstrations. Nearly all the meters in the city of Brest have been progressively furnished with water reservoirs, and their installation has not been the cause of any particular case of condensation. Out of the 2000 meters on this system in action at the present time, not one has given rise to complaint.

With this objection falls that based upon a so-called diminution of lighting power. As the gas contains no more vapour than after its passage through an ordinary meter, it will have the same illuminating power.

The figures given above are the results of experiments conducted with the greatest care, and any one may check and verify them, as well as the interesting conclusions deduced therefrom.

3. *Estimation of the Error due to the Lowering of the Level in Ordinary Meters.*—The estimation of the error due to the lowering of the water level in wet meters will give us an idea of the extent of the advantage resulting from the employment of a constant level system, and particularly that of the water reservoir. The inventors of mechanical systems have almost all of them fixed this error empirically at 5 per cent. of the consumption; but the figure seems exaggerated. A sufficiently accurate estimate may be arrived at with the elements actually at our disposal, without occupying ourselves with a few special cases which cannot influence the final result.

If we consider the conditions under which meters are fixed, we find that they come into one of the three following categories:—

1. Meters placed in subsoils or cellars, at the constant temperature of 12° C.
2. Meters placed in the fronts of shops, exposed to a temperature higher than the preceding, being always in communication with the air of the shops, warmed in the winter, and exposed to variations of temperature during the spring.
3. Meters placed in apartments, offices, and kitchens, exposed to exceptional temperatures all the year round.

In these three categories, which comprise all kinds of meters, evaporation of the water takes place.

The gas which comes from the main, containing only 4·5 grammes of vapour of vapour, it will obviously take up in the first category, at a temperature of 12° C., 5 grammes of water per cubic mètre; in the second category, at 16° C., 7 grammes; in the third category, at 20° C., 10·5 grammes.

Taking these figures as a basis, and calculating the number of meters entering each of the categories, an estimate offering a perfect guarantee of correctness will be easily arrived at. This calculation, however, which might perhaps be interesting in the case of large companies, is by no means necessary for obtaining the estimate we seek.

It may be admitted that the temperature of meters is practically the same as that of the houses in which they are placed—viz., 14° C., on an average, this being also the average temperature of the apartments in which the meters are stamped. The average quantity of vapour contained in a cubic mètre of gas from the mains is 4·5 grammes. Under these conditions, the evaporation due to the passage of a cubic mètre is 6·5 grammes, which gives—

For a monthly consumption of 45 cubic mètres of gas
in a 3-light meter . . . . . 292 grammes.
Ditto of 75 cubic mètres in a 5-light meter . . . . 487 ,,
Ditto of 150 cubic mètres in a 10-light meter . . . 974 ,,

In the first case the error at the end of a month is obviously 5 per cent., and in the second and third cases 4 per cent. to the detriment of the company.

Consequently, a meter with constant water level adapted to the small capacities composing 90 per cent. of the meters already fixed, offers an advantage of 2½ per cent. over the ordinary meters. That is a minimum figure which would doubtless increase in consequence of the abnormal working of those meters which are overtaxed, or placed in elevated temperatures, as meters in cold situations are far from offering as much compensation as the preceding.

The rapid increase in the consumptions of certain gas consumers of Brest after the fixing of meters on the constant water-level system furnishes me with fresh evidence of real practical importance. The results of some carefully-conducted experiments made by the Paris Gas Company, on meters varying from 5 to 20 lights, placed in some of their offices in positions similar to those in which consumers meters are ordinarily fixed, showed an increase of 5 per cent. at the end of a month, or 2½ per cent. of the consumption. All these results lend each other mutual support, and their accuracy cannot be contested.

4. *Practical Realization of the Principle of the Water-chambered Meter.*—The first idea that presents itself for the utilization of a partitioned water reservoir is to place the meter upon it in such a way that the former shall serve as a pedestal for the latter. This arrangement, which was the one I first adopted in 1871, offers some slight inconvenience. By it the dimensions of the meter are considerably increased, and, on account of the special inlet required for the gas, the substitution of a water-chambered meter is rendered more difficult. These objections of detail led me to modify the construction of the instrument.

The water-chambered meter which I have definitively adopted is identical in form and dimensions with the ordinary meter. I have utilized the hydraulic box of the syphon for the formation of a water reservoir. The maintenance of the water level in this reservoir is effected with the overflow water from the meter, by means of a special water inlet arranged on one side of the reservoir. It is this arrangement in its entirety that is new, and that realizes the practical type of a water-chambered meter. Its form being the same as that of an ordinary meter, it may at pleasure be substituted for one of the old kind, the change being effected with little trouble and at trifling expense.

Advantages to be Derived from the Use of the Water-chambered Meter.—The first and most important is the increase in the consumption registered, resulting from the correct measurement of the gas delivered. This may be estimated at 5 per cent. at the end of a month in small works, or on an average 2½ per cent. of the receipts, and at over the latter amount in large towns.

This system offers every security against the negligence of servants, and entirely does away with the liability to failure of supply through the lowering of the water. The constant level system affords large companies an opportunity of reducing the number of their servants, by offering the facility of regulating the water level once in two months only, which is quite sufficient. The inspector would, therefore, have to take the index twice to one regulation of the water level. This operation is a very simple one, and occupies less time than an ordinary meter, owing to the special arrangement of the water reservoir. Its price is but a little above that of the ordinary meter, and this increased cost is soon repaid by the augmentation of the receipts.

These are the incontestable advantages of this system, which I was the first in France to bring under the notice of gas companies, and to which, during the past four years, I have constantly invited their attention; and the results obtained being supported by the double authority of theory and practice, their accuracy cannot be doubted.

I shall not follow the meter makers in their unfruitful and passionate discussions upon the validity of my patents, or dwell upon imaginary objections arising from ignorance or routine. The real question, as I have said, is, Does the water-chambered meter offer any real advantages? Are those advantages realized by the system I have introduced? And what disadvantages has it been shown to possess?

In the foregoing communication I believe I have elucidated the question from the gas companies point of view, and victoriously refuted any objections which may have been raised. I will only repeat, in conclusion, that the adoption of my system increases the profits of the gas companies by 2½ per cent. at the least, and that is all they desire to have clearly shown in this controversy.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The course of the local iron trade has been very uneventful during the week, so far as actual transactions, whether in ores, pig iron, or finished iron, are concerned; but in some respects it has proved to be fraught with matters of no little interest. These have for the most part arisen in connexion with the amazing and almost incredible disclosures which have been made by the publication of the annual reports of several of the local limited liability companies. In the case of the Albion Steel and Wire Company, the deficiency of the past year is not less than £13,900, or a total loss of about £73,000 in about four years. The works of this concern are now suspended, and the debenture holders have decided to accept interest at the rate of 2½ per cent. for this year only, in order to give the company a chance of being restarted on a better footing. In another instance, that of G. and J. Brown and Co., Rotherham, the directors annual report (issued a day or two since) shows that the loss on the year's transactions has been £4164, which, added to the previous deficiency of £31,270, makes a total of £35,434.

Pig iron has been fairly firm this week, a number of parcels of foundry numbers having changed hands at 60s. to 64s. per ton, at the works. Agents of the North of England firms are quoting about the following figures, approximately, for general makers brands:— No. 1 foundry, 54s. 6d.; No. 2 foundry, 52s.; No. 3 foundry, 49s. 6d.; No. 4 foundry, 48s. 6d.; No. 4 forge, grey, 48s.; No. 5 forge, mottled, 47s. 6d.; No. 6 forge, white, 47s.; refined metal, 69s.; Kentledge, 57s. 6d.; and cinder pig, 39s. to 40s. per ton, on net cash terms. The principal brands of hematite pig iron are steady at last week's quotations.

Merchant, and general finished iron is stiffer, there being an impression abroad that Staffordshire irons may be advanced in price before long, should the dearness of fuel continue to grow.

In the local coal trade there is an evident desire to obtain more money for all classes of fuel, particularly "households." Steam coal is firm, but not as yet officially advanced. An effort is being made to develop Keadby as a shipping port, in place of sending the South Yorkshire coal to Hull or Grimsby.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

As was generally anticipated, the advance in the price of coal, which came into operation on the 1st of November, has had a very prejudicial effect upon the iron trade of this district. The market now rules very dull, and prices, though necessarily somewhat stiffer, are most irregular. For the commoner qualities of finished iron, makers are now asking 7s. 6d. to 15s. per ton more than the prices ruling a few months ago; but few specifications are being placed, and the prospects of business for the coming winter are indeed gloomy. No change has yet been made in the prices of the better qualities of branded iron, which are still being dealt in on the basis of £10 for marked bars; and it is very probable that, in the present prostrate condition of the trade, prices will remain unaltered. The only current demand worthy of note is for best sheets and nail rods.

In pig iron the advance ranges from 2s. 6d. to 7s. 6d. per ton, according to quality, for the common and medium descriptions. In cold-blast iron there has, as yet, been no advance declared. The new business doing is of unimportant extent, and the effect of the competition of the Northern and other districts is more keenly felt than formerly.

The coal trade is also most unsettled, the coalmasters association being divided against itself. Prices are weak and irregular, and there is now more underselling going on than has been observable for some time past. A comparatively few only of the large consumers of fuel are paying the full advance, and as regards manufacturing coal, the local market seems quite disorganized. Since the increase in the rate of pay, the miners are said to be doing less work than ever, and at several collieries a premium is being offered to the men to induce them to work full time.

The price of the Earl of Dudley's best thick coal, which nominally rules the market, is now 18s. per ton.

The condition of both the coal and iron trades of this district is well illustrated by the local share list. The Chillington Iron Company's shares, £10 paid, are selling at £5. The Gelsall Coal and Iron Company's shares, £15 paid, are quoted at £10; and John Bagnall and Sons, limited, £10 paid, are quoted at £6.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

For best coal there is throughout Lancashire a continued active inquiry, and stocks of this class of fuel are steadily decreasing. Colliery proprietors, however, are not in all cases riddling so much coal as they might do, as the production of small coal and slack is already in excess of the demand, which is still only very moderate, owing to the quietness in the iron-making and manufacturing trades. Prices of most of the best classes of coal, suitable for house purposes, show a decided stiffening tendency, and in addition to the advances of 1s. per ton, which I noticed last week, some of the firms in West Lancashire have put 1s. 6d. and 2s. per ton upon their last month's rates. These, however, are exceptional cases, and, as a general rule, the quotations for house coal in the above district are stiffer, to the extent of 6d. and 1s. per ton; the pit prices ranging about 13s. 6d. to 14s. for Arley Mine coal, 11s. 6d. to 12s. for Pemberton four-feet, and 9s. to 10s. per ton for common house-fire coal. Engine fuel and slack, however, remain without change, and are still quoted at 6s. 6d. to 7s. per ton for burgy, and 4s. to 5s. per ton for slack at the pit mouth. In the Manchester market the list prices for house coal have not been altered; but merchants and dealers are taking advantage of the pressure for this class of fuel to get better prices.

In gas coal a little more activity is reported in some quarters; but generally there is no great amount of business doing.

The coke trade continues exceedingly flat, and prices are little more than nominal.

The annual meeting of the South-West Lancashire and Cheshire Coalowners Association was held in Manchester on Tuesday last, and Mr. W. Pilkington, of St. Helen's, was elected president for the ensuing year.

The iron market continues exceedingly flat, with very little doing. Middlesbrough pig iron, for immediate delivery in this district, is quoted at 57s. 9d. for No. 3 foundry; 56s. 9d. for No. 4; and 55s. 9d. for No. 4 forge, with 1s. less on foundry, and 6d. less on forge for delivery over a few months. Manufactured iron is also dull. Middlesbrough bars delivered in this district are offered freely at £7 17s. 6d. per ton; angles are quoted at £8; plates at £8 2s. 6d.; T-irons at £10; light rails at £7 10s. to £7 12s. 6d., and heavy ditto, 5s. less.

Founders are getting more short of orders, and the forges are still only moderately employed, whilst engineers continue to reduce the number of their *employés*.

A general meeting of the Institution of Mechanical Engineers was held in Manchester on Friday—Mr. John Ramsbottom, one of the past presidents, occupying the chair. There was a good attendance of members, and papers on "Mechanical Ventilators for Mines," by Mr. Wm. Daniels, of Leeds; and on the "Ultimate Capacity of Blast Furnaces," by Mr. C. Cochrane, of Stourbridge, were read.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

By Saturday night the heavy fleets of sailing vessels, some of which had been detained coal laden close upon a month, met with a fair prospect of making their voyages south. Steam shipping has been kept very active in the London and coasting trades; and the shipments from the Tyne Dock of household and gas coals have been fully an average. The price of household and gas coals is without much change, but steam and household coals have not been in a more depressed condition than they are at present, and they are sold at a variety of prices, as the colliery offices can find a market for these. Coke is not in much request either. The steam coalowners have given notice of a reduction of 20 per cent. upon the pitmen's wages, and we seem to be upon the eve of a general reduction of wages throughout the northern mining districts. The Tyne Shipbuilding Masters Association are giving their men notice of a termination of their present engagements, with a view to a reduction of wages, and the manufacturers engaged in the chemical trade upon the Tyne and district have intimated to the committee representing the men a proposed reduction of 10 per cent. upon wages, and the movement is becoming general amongst masters.

The chemical trade is in a very depressed state. Prices have been lower this week than they have been this year, and the quotations current in the market, and upon which the business of the trade is transacted, are nearly one-half less than they were in 1873. Trade in the Cleveland iron district shows no signs of improvement. Indeed, the prospects for the winter there are most unsatisfactory. One of the leading iron manufacturing firms in Middlesbrough, Messrs. Bolckow, Vaughan, and Co., Limited, gave their men notice, a week gone last Saturday, of the termination within a fortnight of their present engagements; and there is every appearance of a very considerable restriction of trade in Cleveland and South Durham during the winter. The finished iron trade of the Tyne is not in so depressed a condition.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

So far as gas matters are concerned, the principal scene of interest during the past week or ten days has been Dundee and the adjoining burgh of Broughty Ferry. There are complaints in Dundee that the gas is of low illuminating power; but at a meeting of the Gas Commission a few days ago, the chairman stated that the lowest test during the past month was over 26 candles, while on the day before the meeting it was fully 28 candles, the range over a period being rather more than 27 candles. That is a long way ahead of the illuminating power that the Corporation Gas Commissioners are bound to give, their Act providing for gas of not less than 18 standard candles in illuminating

power. The complaints, however, were not confined to the general consumers, as the late meeting showed that even some of the commissioners were not actually aware of the provisions of the Act under which they hold a corporate existence. Great faith was expressed, in Mr. M'Crae, as a gas manager, and it was eventually resolved that in all future monthly returns the illuminating power of the gas should be stated, and that at least two tests should be taken in each week. The September report stated that 1446 tons 15 cwt. of gas coal had been carbonized during the month, and that the gas made during the same period was 16,346,600 cubic feet, which shows an average of nearly 11,300 cubic feet per ton of coal.

One of the Gas Commissioners of Broughty Ferry affirms that the gas in that town is higher in illuminating power by three candles than that of Dundee, and that the leakage is 2 per cent. less than in Dundee; and he declares that the experience with the water service is not in favour of the chances of Dundee being allowed to swallow up the Broughty Ferry Gas-Works. Another correspondent strives to show that Dundee has no room to "crow" over Arbroath, in connexion with the corporation gas supply, for, though the deficiency in Arbroath last year was £582 10s. 9d., that of Dundee amounted to no less than £2051 17s. 3d. A third correspondent takes up the relative price of gas in Dundee and Aberdeen, his aim being to show that Aberdeen is more successful with the results of the efforts made by the Gas Commissioners and their manager, Mr. Smith, than Dundee can boast of.

At a meeting of the Glasgow Water Committee on Monday, the 1st inst., it was resolved, on a recommendation from the conveners and sub-conveners of committees, to increase the salary of the engineer, Mr. Gale, by £300 per annum—from £700 to £1000—on condition that he devote his whole time to the duties of his office. Some objection was raised against the advance; but the Lord Provost, who presided, referred to the salaries of other engineers—including Mr. Deas, engineer to the Clyde Navigation Trustees, whose salary was £1400—and said that, as one who employed engineers himself, he was satisfied personally that £1000 per annum was a very moderate sum for Mr. Gale's services.

Having mentioned Mr. Gale and the Glasgow Water Commissioners, I may take notice of the fact that the council of the Glasgow Landlords Association, at their last monthly meeting, had a special conference for the consideration of "The waste of water in Glasgow, Mr. Gale's report as to the cause, &c., and the action of the commissioners in regard to such report," &c. After the subject was discussed at some length, the further consideration of it was adjourned, so that the whole question was remitted to a committee to prepare a report, approach the commissioners, or take whatever steps may seem best in the interests of the proprietors.

The Lintrathen water scheme has again been under public notice lately. On this occasion it was specially on account of a public testimonial to Bailie Robertson, who, as chairman of the Works Committee, had gone through such a vast amount of labour in the service of the Dundee Water Commissioners and the ratepayers. The testimonial was a magnificent silver dessert service, of the value of about £650. The pipes from Lintrathen to Dundee are intended to convey 8,000,000 gallons per day, and it was lately stated that they were doing that amount of work, but I believe I am correct in saying that only a little over 6,000,000 gallons are passing through per day.

Public meetings have lately been held at Kirkwall for the consideration of the water supply and drainage questions. The total cost of water, drainage, and paving is estimated at from £15,000 to £20,000.

The operations in connexion with the Dalry Gravitation Water-Works are now in a forward state. A test of a most satisfactory character was made last Saturday, and very shortly the supply will be made available for domestic purposes.

Messrs. Leslie's proposed water scheme for Irvine aims at taking the water from a point about 7½ miles north of the town, with a reservoir at an elevation of 300 feet above sea level, capable of containing 52½ million gallons, the cost of the whole works being estimated at £24,000. The local authority of Dundonald parish have resolved to co-operate with Irvine in carrying out the proposed scheme.

The authority of the Board of Supervision in sanitary matters has just been shown at Carluke, the result being a proposed water supply and a drainage scheme.

As high as 62s. 3d. was quoted for Glasgow G.M.B. iron during the past week, but on Friday the rate had declined to 61s. 7½d., a good business being done. There has been some advance in the price of makers iron since last report.

The coal market exhibits no new features. On the west coast the shipping orders are very meagre. Leith and some of the other eastern ports are somewhat pushed at present, and for immediate shipment a little better price has been obtained. A short supply of empty waggons is being felt at some of the collieries, but by a little exertion on the part of the railway companies this difficulty might be overcome. House coal is in better demand, consumers having commenced to lay in a winter's supply. The following are the quotations, free on board, at Glasgow Harbour cranes:—Wishaw Main coal, 7s. 3d. to 8s. per ton; house coal, 8s. 6d. to 10s. 6d.; splint coal, 8s. 3d. to 8s. 9d.; steam coal, 8s. 9d. to 10s.; smithy coal, 14s.

SUICIDE OF A GAS MANAGER.—On Friday last, Mr. Chandler Tadman, for many years manager of the British Gaslight Company's works at Norwich, committed suicide by shooting himself through the head with a revolver. The bullet passed through the brain, causing instantaneous death. He has left a widow and several children.

CHARGE OF CONSPIRACY BY GAS STOKERS.—The proceedings against certain men in the employ of the Newcastle (Staffs) Gas Company, to which reference was made in the JOURNAL of the 26th ult., was to have come on again on Thursday last, and some serious issues were involved; but a compromise has been effected, and the proceedings withdrawn.

REDUCTIONS IN THE PRICE OF GAS.—The Corporation of Halifax have resolved to reduce the price of gas on Jan. 1 next to 3s. 8d. in the borough and 5s. beyond, with the same discounts as at present. The directors of the Bilston Gas Company announce a reduction of 3d. per 1000 cubic feet to their customers within the township of Bilston. The reduction is to date from Oct. 1. Owing to the great loss of gas by leakage, caused by mining operations, the directors express regret that they cannot extend the benefits of this reduction to the outlying districts. The prices are now 3s. 4d., 3s. 9d., and 4s., the average being 3s. 9d. per 1000.

FIRE AT THE SOUTH SHIELDS GAS-WORKS.—On Wednesday morning last a portion of the premises of the South Shields Gas Company was discovered to be on fire. The place where the fire occurred adjoined the retort-house, and the hose in connexion with the works having been got out, efforts were made both to subdue the fire and, at the same time, to prevent its extension to the retort-houses. The exertions to prevent the fire spreading were fortunately successful, but it was not until after the lapse of about an hour and a half that it was entirely subdued, when the room was found to be literally gutted. The cause of the fire is not known, but it is believed to have arisen from an explosion of foul gas in the ammonia-pan. The police fire brigade were early upon the scene, but the large staff employed at the works was found to be sufficient to cope with the fire.

SWANSEA GAS SUPPLY.—At a meeting of the Swansea Town Council, last week, the report of the committee appointed to wait upon the gas company, with a view to bringing about a reduction in the price of gas, was read. The committee requested that the cost of gas to all parties should not exceed 3s. per 1000 cubic feet. A letter had since been received from the company, enclosing copies of resolutions adopted by them, agreeing to supply gas to the board, from the 1st of January next, at 3s. 3d., and to private consumers at 3s. 6d. per 1000. The committee deemed these reductions inadequate, and were not prepared to recommend the council to agree to them. They also recommended the council to discontinue the present system of paying for the gas supply to the public lamps from the 1st of January next, and to adopt the average meter system. The council received and approved the report of the committee.

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

3758.—PINKERMAN, W. J., Strand, London, "Improvements in lamps." A communication. Oct. 29, 1875.

3759.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in furnaces or kilns for carbonizing and distilling solid substances, and in apparatus or means employed in connexion therewith." A communication. Oct. 29, 1875.

3813.—TILLYER, W. J., Southsea, "A new or improved application of boss with stop-valve for opening and closing the supply upon the application or removal of a tap." Nov. 3, 1875.

3826.—CORNFORTH, S., and RATCLIFF, F. and W. H., Birmingham, "Improvements in the manufacture of gas for illuminating and heating, and in apparatus employed in the said manufacture." Nov. 3, 1875.

3827.—MATHEWS, T., Whitfield Street, London, "Improvements in meters or apparatus for measuring and indicating the flow of fluids." Nov. 3, 1875.

3828.—VACHEROT, A., Battersea, London, "Improvements in rotary engines, rotary pumps, and other like apparatus." Nov. 3, 1875.

3831.—HAHN, H., Lombard Street, London, "Improvements in apparatus for carburetting atmospheric air for illuminating purposes." A communication. Nov. 4, 1875.

3833.—MACARTNEY, G., Greenock, N.B., "Improvements in couplings for fire hose or other pipes or tubes." Nov. 4. 1875.

3838.—WHITE, W., Pontypool, Mon., "Improvements in apparatus used in the manufacture and distribution of gas." Nov. 4, 1875.

GRANTS OF PROVISIONAL PROTECTION.

3143.—LAKE, W. R., Southampton Buildings, London, "An improved engine to be operated by steam, hot air, or water, and which may also be used as a pump or a fluid-meter." A communication. Sept. 7, 1875.

3668.—SLATER, J. W., Tamworth Terrace, London, "Improvements in the treatment of sewage deposits or precipitates, or sewage sludge, in order to obtain therefrom ammonia, illuminating gas, and other useful products." Oct. 21, 1875.

3671.—FOSTER, B. H., Newcastle-on-Tyne, "Improvements in filters." Oct. 22, 1875.

3680.—AITCHISON, A., Manchester, and WHYTE, J., "Improvements in the manufacture of gas for illuminating, heating, and cooking purposes, and in apparatus employed therein." Oct. 23, 1875.

3703.—RAWSON, C., Victoria Chambers, and SLATER, J. W., Tamworth Terrace, London, "Improvements in the treatment or purification of sewage and other matters, and in the treatment or preparation of agents to be used in the said purification." Oct. 25, 1875.

3739.—CLARK, A. M., Chancery Lane, London, "Improvements in the ventilation and water supply of buildings and apartments." A communication. Oct. 28, 1875.

3747.—FIELD, R., Cannon Row, London, "Improvements in syphons for effecting intermittent discharge of liquid from sewage tanks and other vessels." Oct. 28, 1875.

NOTICES TO PROCEED.

2328.—PEEBLES, D. B., Edinburgh, "Improvements in governors or apparatus for regulating or controlling the pressure and flow of illuminating or other gas." June 26, 1875.

2303.—BELL, A. P., and THORP, T., Manchester, "A new and improved apparatus for lighting gas automatically." Sept. 21, 1875.

3396.—MONCKTON, E. H. C., Wansford, Northampton, CREASY, J. T., Lambeth, and TULLY, W., North Bow, London, "Improvements in apparatus or machinery for utilizing the pressure of water, oil, air, gas, steam, or other fluid as motive power." Sept. 29, 1875.

3398.—WALKER, W. T., Highgate, London, "An improved gas-testing cock." A communication. Sept. 30, 1875.

3477.—ARROWSMITH, J. J., and FERGUSON, H., Liverpool, "Improvements in plugs or stoppers for tubes." Oct. 7, 1875.

3539.—LEONARD, W. A., Holborn Viaduct, London, "Improvements in continuous ignition fuses and in the friction match composition employed therewith, which composition is applicable to friction matches generally; also in apparatus or means for propelling and igniting the said fuses, applicable to the lighting of lamps and gas-burners of all kinds, cigar lighters, torches, and other purposes of ignition." Oct. 12, 1875.

3542.—NEWTON, H. R., Seymour Street, London, "A locking apparatus for regulating a constant measured small or large supply of filtered or unfiltered water, to be delivered into existing cisterns or other reservoirs, or by a new system into closed tanks." Oct. 12, 1875.

3615.—ABEL, C. D., Southampton Buildings, London, "Improvements in engines worked by gas and air, and in their application for raising or forcing liquids." A communication. Oct. 18, 1875.

3625.—CLARK, A. M., Chancery Lane, London, "Improvements in water-meters." A communication. Oct. 19, 1875.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

1729.—GORDON, J., Glasgow, "Improvements in waste-preventing stop-cocks or valves." May 10, 1875.

1953.—JONES, F. C., Blackfriars Road, London, "Improvements in supplying and regulating the supply of water by means of a self-acting apparatus for urinals and other purposes." May 28, 1875.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

2874.—SWAIN, S., "An improved joint for connecting the supply pipe with the pendant pipe of moveable pendant lamps, employed to illuminate shop fronts, or the exterior of buildings, and other like uses." Sept. 30, 1872.

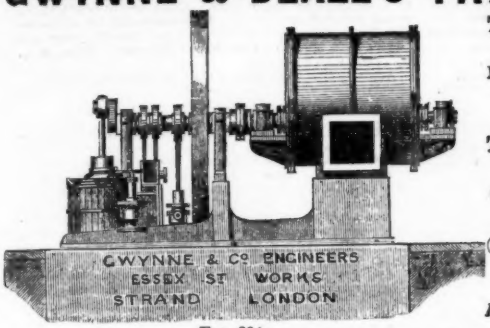
2928.—HICKMAN, J. W., "Certain improvements in taps or cocks for drawing off fluids and liquids." Oct. 4. 1872.

2934.—BARNETT, H. B., and SLADE, W. B. M., "Improved manufacture of fluids for deodorizing and disinfecting purposes." Oct. 4, 1872.

2948.—AITKEN, P., "A new or improved gas cooking and heating apparatus or stove." Oct. 7, 1872.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,



The BEST EXHAUSTERS IN THE WORLD.

Made under the personal superintendence of

Mr. BEALE,

The oldest Maker, Inventor and Patentee of

GAS-EXHAUSTING MACHINERY.

(It is NOT CORRECT to state that Mr. BEALE has RETIRED.)

Prices and every information on application.

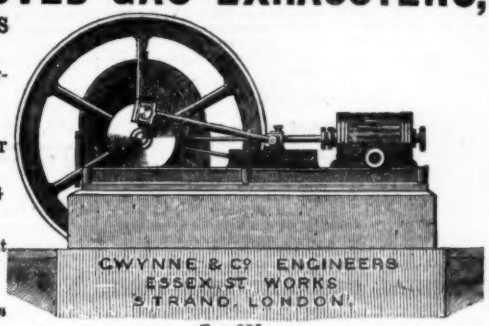


FIG. 224. FIG. 225.

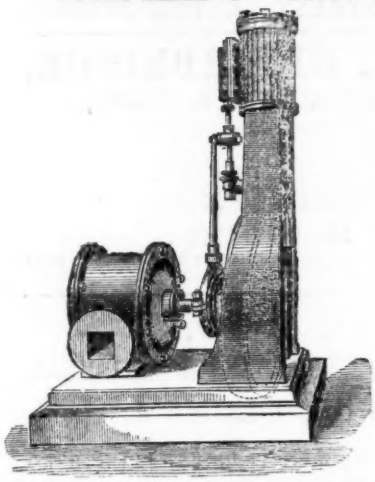
Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES, CAN BE HAD ON APPLICATION TO

GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.

G. & Co. are now manufacturing for a London Gas Company three of their 210,000 cubic feet Patent Gas Exhausters, and many of all sizes.

BEALE'S IMPROVED PATENT GAS-EXHAUSTER



WITH

ENGINE COMBINED

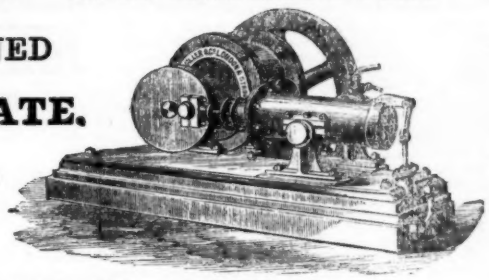
ON

ONE BASE PLATE.

SOLE MAKERS,

GEORGE WALLER & CO.,

Who, since Mr. BEALE'S retirement, are the Oldest Makers.



EXHAUSTERS with HORIZONTAL ENGINE combined.
EXHAUSTERS with OUTSIDE BEARINGS.
MAKERS of ENGINES, BOILERS, and GAS MACHINERY.
TAR, LIQUOR, and SYPHON PUMPS. GAS-VALVES in stock, 2 to 30 inches.
SELF-ACTING BYE-PASS VALVES, with Lid and Relieving Lever.
MANN'S and many other descriptions of WATER DISTRIBUTORS.
SCRUBBERS, PURIFIERS, and CONDENSERS.
EXHAUSTERS from 3000 to 60,000, new and second hand, in stock.

PHŒNIX ENGINEERING WORKS, HOLLAND STREET, S.E., & at STROUD, GLOUCESTERSHIRE.

SEE ALSO PAGE 704.

D. BRUCE PEEBLES & CO.,

ENGINEERS,

FOUNTAINBRIDGE WORKS, EDINBURGH,

MANUFACTURERS OF **WET AND DRY GAS-METERS;**

Patentees and Sole Manufacturers of PEEBLES' LAMP-GOVERNORS,

ABOVE 30,000 OF WHICH ARE NOW IN USE.

"These Lamp-Governors are so superior that they are likely to supplant all others."—*Dr. Wm. Wallace, F.R.S., F.C.S.*

D. BRUCE PEEBLES AND CO., FOUNTAINBRIDGE WORKS, EDINBURGH.

WANTED, by the Advertiser, a situation as CLERK, Collector, or Assistant Manager in a Gas-Work. Well up in Gas Company's Accounts. Good reference or personal security if required.
Address No. 216, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Gravesend and Milton Gas Company, Kent, a steady Man as FOREMAN STOKER. Must understand the working of an exhauster and clay retorts. Wages 32s. per week.
Address, with references, to Mr. MARVIN, Gravesend and Milton Gas Company, Canal Basin, GRAVESEND.

WANTED, a situation as Manager of a small Gas-Work. Understands main and service laying, meter and gas fitting, internal fitting and retort-setting. Twelve years testimonials.
Address No. 213, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MALDON GAS COMPANY, LIMITED.

WANTED, a Working Manager. One who understands the manufacture of gas, and the general management of Gas-Works, taking meters, laying mains, gas-fitting, &c. Good testimonials as to ability, sobriety, &c., required. Salary £80 per annum, with house rent, firing and gas, and good garden.
Applications to be made, on or before the 17th inst., to HENRY CLARKE, Secretary.

WANTED, the Management or Assistant Management of a Gas-Work. Five years practical experience in the manufacture and distribution of gas.
Address No. 214, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

NEW EDITION, NOW READY,

ADVANTAGES OF GAS FOR COOKING AND HEATING.

By MAGNUS OHREN, A.I.C.E., F.C.S.

For Companies to issue to their Gas Consumers.

Specimen Copy by post Threepence, direct from MAGNUS OHREN, Gas-Works Lower Sydenham, London, S.E.

GAS-WORKS TO BE LET.

TO BE LET, on Lease, for a term of years, the Lower Gornall Gas-Works, Staffordshire.
The works are situated in a very populous neighbourhood, are fitted up with every requisite, are in full operation, and the make of gas and the number of consumers are steadily increasing.
Possession may be had on the 1st of January next, when the present lessee's term expires.
Apply to Mr. F. KENNING, Secretary, District Gaslight Company, Limited, 21, Darlington Street, WOLVERHAMPTON.

WANTED, GAS-WORKS TO LEASE.

THE Engineer of a Work of acknowledged repute is desirous of LEASING a small work. Can offer unusual advantages to companies or proprietors whose undertakings are unremunerative, or have fallen into a dilapidated condition.
Address No. 202, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—8 D-shaped Retort Mouthpieces, 16 in. by 14 in., with doors, screws, ascension-pipes, bridges, dips, and all complete.
Apply to THOMAS WILSON, Manager, Gas-Works, Hornsea, YORKSHIRE.

STATION-METER, second-hand, for SALE, in good condition. Capable of passing 8000 feet per hour, together with bye-pass, valves, and connexions complete. To be sold to make room for a larger one.
Apply to Mr. C. TURNER, Manager, Gas-Works, Ravensthorpe, MIRFIELD.

STATION-METER for Sale, in good condition (Makers West and Gregson) in very ornamental case, fitted up with tell-tales, inlet, outlet, and bye-pass valves, and 12-in. connexions. Passes 25,000 cubic feet per hour. Now replaced with a larger one.
For price, &c., apply to JOHN W. WHITAKER, Manager, Gas-Works, WAKEFIELD.

THE GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that an EXTRAORDINARY GENERAL MEETING of the SHAREHOLDERS in this Company will be held at this Office on FRIDAY, the 19th day of November inst., at Twelve o'clock at noon precisely, when the Directors will apply to the Shareholders—

For authority to raise £500,000 further capital by the creation and issue of new shares.

For authority to convert or consolidate all or any part of the paid-up shares in the capital of the Company into capital stock.

For their approval of "A scheme for the amalgamation of the Imperial Gaslight and Coke Company and the Independent Gaslight and Coke Company, with The Gaslight and Coke Company, in pursuance of sections 18 to 24, inclusive, of 'The City of London Gas Act, 1868,' and of section 56 of 'The Gaslight and Coke Company's Act, 1871.'"

By order,
JOHN ORWELL PHILLIPS, Secretary.

Chief Office, Horseferry Road, Westminster, S.W.,
Nov. 3, 1875.

IMPERIAL GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that an EXTRAORDINARY GENERAL MEETING of the PROPRIETORS and SHAREHOLDERS in this Company will be held at the Company's Office, No. 33, John Street, Bedford Row, London, on Friday, the 19th day of November next, at One o'clock precisely, for the purpose of submitting to them, for their approval at such meeting, "A scheme for the amalgamation of the Imperial Gaslight and Coke Company with The Gaslight and Coke Company (commonly called the Chartered Gas Company) in pursuance of sections 18 to 24, inclusive, of 'The City of London Gas Act, 1868,' and of section 56 of 'The Gaslight and Coke Company's Act, 1871,' and to arrange the remuneration of the Secretary.

By order of the Court of Directors,
HARRY CHUBB, Secretary.

33, John Street, Bedford Row, London, W.C.,
Nov. 3, 1875.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is hereby given that the HALF-YEARLY ORDINARY MEETING of the Proprietors of the Imperial Continental Gas Association will be held at the City Terminus Hotel, Cannon Street, London, on TUESDAY, the 30th inst., at Two o'clock in the afternoon precisely, when a Report will be made to the Proprietors, a Dividend declared for the half year ended the 30th of June, 1875, and the usual ordinary business of such meeting transacted.

Notice is hereby also given that the Transfer Books of the Association, and the Register of Shareholders, will be closed on Tuesday, the 16th inst., and will remain closed until after the Half-Yearly Ordinary Meeting on the 30th inst. By order of the Board of Direction,

ALBERT F. JACKSON, Secretary.

No. 30, Clement's Lane, Lombard Street,
London, Nov. 8, 1875.

Sale of 85 Six per Cent. Preference Shares, 20 Ten per Cent. Original Shares, and 45 Seven per Cent. Ordinary Shares, all fully paid up, in the Crystal Palace District Gas Company; and 25 fully paid-up £10 shares in the Colney Hatch Gas Company.—By order of the Executor.

MESSRS. DEBENHAM, TEWSON, & FARMER will SELL at the Mart, on Tuesday, Nov. 16, at Two o'clock, in four lots, 20 £10 Preference Six per Cent. Shares, 20 £10 Original Ten per Cent. Shares, and 45 £10 Ordinary Seven per Cent. Shares, all fully paid up, in the Crystal Palace District Gas Company; also 25 £10 Shares, fully paid up, in the Colney Hatch Gas Company.

Particulars of Messrs. SHARP AND ULLITHORNE, Solicitors, 1, Field Court, Gray's Inn, and of the AUCTIONEERS, 80, CHEAPSIDE, E.C.

SOCIÉTÉ TECHNIQUE DE L'INDUSTRIE du GAZ en FRANCE.

(FRENCH ASSOCIATION OF GAS MANAGERS.)

MEETING for 1876.—PREMIUMS for PAPERS.

The Committee of the above Society beg to announce that at the forthcoming ANNUAL MEETING, to be held at LYONS in the month of MAY next,

A PREMIUM OF 500 FRANCS,

voted at the General Meeting on the 24th of May last, will be awarded to the Author of the best unpublished Paper, in French,

"On the Progress made in Gas Industry during the past Ten Years."

The work is to be an exhaustive study of the subject, and not merely an historical survey. Each Author will be at liberty to treat more particularly one of the principal branches of the industry.

A PREMIUM OF 250 FRANCS,

offered by a Member of the Committee, will also be awarded to the Author of the best unpublished Paper, in French,

"On the Best and Most Economical Means of Laying Mains Gas-tight, and of Discovering and Remedying Escapes."

CONDITIONS OF COMPETITION.

1. All persons, whether Frenchmen or foreigners, Members of the Société Technique or not, are eligible to compete.
2. The Papers must be unpublished productions, and written in French.
3. Each Paper must bear upon its front page a motto, which must also be written upon a sealed envelope containing the name of the Author.
4. The Manuscripts must be deposited in the Society's Offices, 21, Rue Abbatucci, Paris, before March 1, 1876.
5. All the Papers will remain deposited in the archives of the Society.
6. The successful Papers will be published in the Society's Annual Report.
7. The Premiums will be awarded by the Committee on the Report of a Commission of Five Members nominated by it.
8. The Premiums will be awarded in General Meeting.

BAHIA GAS COMPANY, LIMITED.

NOTICE is hereby given that the ORDINARY HALY-YEARLY GENERAL MEETING of this Company will be held at the London Tavern, Bishopsgate Street, London, on TUESDAY, the 16th day of November, 1875, to receive the Report of the Directors, the Balance-Sheet approved by the Auditors, and for general purposes.

The chair will be taken at One o'clock precisely.

By order of the Board,
ALFRED J. HEAD, Secretary.

10, Coleman Street, London, Nov. 2, 1875.

IN THE MATTER OF BRONNER'S PATENT BURNERS.

NOTICE is Hereby Given that Julius Brönner, on the 20th of April, 1875, in a suit in Chancery, 1874, B 365, obtained an injunction perpetually restraining the Defendant, his Agents, Servants, and Workmen, from in any way advertising or offering for sale, or selling, or from in any manner causing to be advertised, or offered for sale, or sold as "Real Brönner," or "Brönner," or "Broehner" Burners, any Burner not manufactured by or for the Plaintiff, Julius Brönner, or by his Agents.

JACKSON, FOX, AND ELLEN,
55, Chancery Lane, London,
Solicitors for the Plaintiff,
JULIUS BRÖNNER, Frankfort-on-Maine.

FOR SALE—Two plain Cylindrical ended BOILERS, 16 ft. long, 4 ft. diameter, ⅜ in. thick, about 2 tons each, with usual fittings. Taken out to be replaced by larger ones. Also a lot (70 or 80) 15-in. round Retort Mouthpieces. A corresponding lot of Ascension-Pipes, tapering from 7 in. to 4 in. inside diameter, and twelve 7¼ ft. lengths of D-shaped Hydraulic Main, 18 in. by 14 in., with 3-in. dip.

Apply to the SECRETARY of the Gas Company, BATH.

TO ACCOUNTANTS AND COLLECTORS.

THE Directors of the Cheltenham Water-Works Company, require a thoroughly qualified ACCOUNTANT and Collector. He will be required to devote his whole time to the service of the Company, must thoroughly understand book-keeping, and keep all books as directed. He must be prepared to commence his engagement on the 31st of December next. First-class references and security required. Salary £150 per annum, with house, taxes (except income-tax), rates, and water free.

Applicants to state age and experience, where last employed, and to forward testimonials to the undersigned on or before the 16th inst.

E. LLOYD GRIFFITHS, Clerk to the Company.

2, Crescent Place, Cheltenham, Nov. 1, 1875.

MESSRS. JOHN BETHELL & CO.,

(ESTABLISHED 1836,)

CONTRACTORS for GAS TAR,

MAKERS OF ANTHRACENE, CREOSOTE, &c.,

CLAYTON CHEMICAL WORKS, MANCHESTER;

SWAN VILLAGE, WEST BROMWICH.

Head Offices: 38, KING WILLIAM STREET, LONDON BRIDGE.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

GEORGE ORME & CO.,

GAS METER MANUFACTURERS, BRASSFOUNDERS & FINISHERS,

ATLAS METER-WORKS, OLDHAM.

CONSUMERS WET & DRY GAS-METERS ON THE MOST APPROVED PRINCIPLES.

STATION-METERS, GOVERNORS, PRESSURE-REGISTERS,

And every Description of Gas Apparatus.

GAS, STEAM, AND WATER FITTINGS.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

CLYDE TUBE WORKS, GLASGOW & COATBRIDGE.

OFFICES, 41, OSWALD STREET, GLASGOW,

ANDREW & JAMES STEWART,

MANUFACTURERS OF

WROUGHT-IRON WELDED TUBES AND FITTINGS,

GUN METAL & OTHER COCKS, ALL KINDS OF IRON & BRASS FITTINGS

For GAS, WATER, and STEAM;

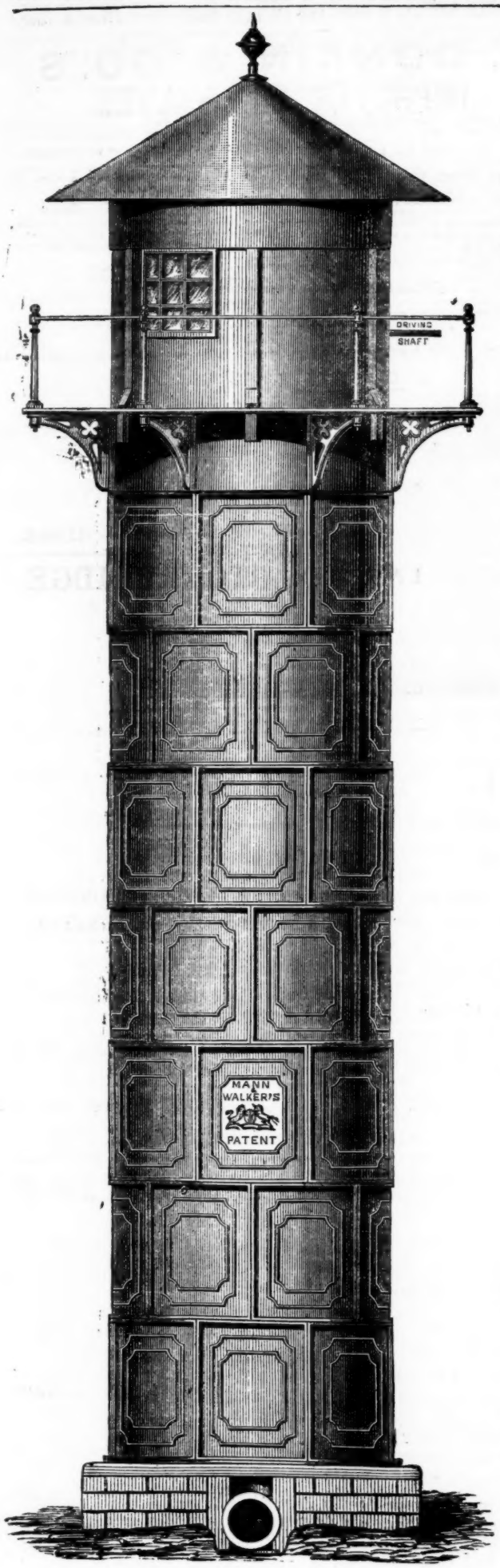
CAST-IRON PIPES, CORE BARS for IRONFOUNDERS,

STOCKS, DIES, and TAPS, GAS PLIERS and TONGS, &c., &c.,

ALWAYS KEPT IN STOCK.

LAP-WELDED IRON BOILER TUBES,

As supplied to the English, French, and Dutch Admiralties, and principal Railways and Engineers at Home and Abroad.



C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

The improvements made during the past three or four years in all the parts of the internal and external construction and machinery of these Scrubbers have rendered them perfect for their work of purification with all kinds of coal, and their cost is less than any other method of completely purifying gas from ammonia.

They contain their own motive power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

They are, in all cases, constructed under guarantees to perfectly perform their work. They are now extensively used in the largest gas-works of London and the chief cities of Europe, **nearly one hundred being in use,** and their perfect efficiency and profit to a gas company have been fully established with every variety of coal used in Europe. References can be given to the largest gas-works in Europe.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

MR. HODGSON JONES, Memb. Inst. Civil Engineers of London and of Paris, has REMOVED his Offices to 26, Great George Street, London, S.W., where he may be consulted on all questions relating to Gas and Water Works, Drainage, Sanitary Works and Estate Improvements.

T. NEWBIGGING,
CONSULTING GAS ENGINEER,
ECCLES, MANCHESTER.

HENRY LYON,
CONSULTING GAS ENGINEER,
BROOKLYN, CHEETHAM HILL ROAD,
MANCHESTER.
Twenty-three years at the Rochdale Road Works.

D. M. NELSON,
48, GORDON STREET (late 135, BUCHANAN ST.),
GLASGOW,
Supplies every requisite in connexion with the distribution of Gas and Water.
Estimates and prices on application.
WOOD GRIDS for Purifiers and Scrubbers.
Cast-Iron PIPES and VALVES.
Street LAMP-PILLARS.
Patent Pipe SCREWING-MACHINES, &c.

Mr. ALFRED LASS,
60, CORNHILL, LONDON, E.C.,
Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.
To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.
To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

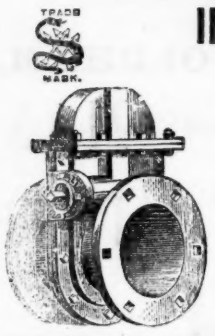
TO INVENTORS AND PATENTEES.
MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.
Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.
Patents procured for Foreign Countries.
Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street WESTMINSTER.

Just published, price 10s. 6d.,
REGISTRATION OF DISTRIBUTORY PLANT.
The forms for this purpose are to illustrate the Paper on Distribution of Gas, read at the Edinburgh Meeting of the British Association of Gas Managers. By the use of the synopsis the whole of the out-door plant may at once be seen, with all matters pertaining to the same.
W. J. WARNER, Engineer.
South Shields.

BAILEY'S Patented Inventions are now in extensive use wherever steam is known. Bailey's Patent Steam Gauges, Pyrometers, Water Gauge Cocks, Test Pumps, Fusible Plugs, Steam and Water Valves, Safety Valves, Junction Valves, Pumps, Tell-Tales, Recorders, Lightning Conductors, Electric Telegraphs, Turret Clocks, Steam Joint Cement, Lifting Jacks, Boiler Feeders, Lime Catcher and Separator, Injectors and Ejectors, and every description of first-class Brass Work for Engines and Boilers. Gas-Works Managers who have not our large book should send for it.

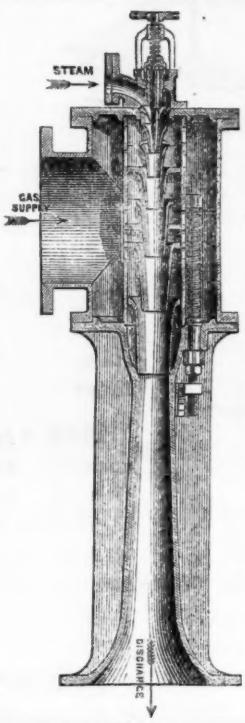
16th edition, 1000 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000,
BAILEY'S Illustrated Inventions, containing details and prices of goods in our five several departments:—(1) Brass Foundry, Steam Gauges, Indicators, Feeders, and Fittings; (2) Engineers Sundries, Small Tools, and Stores; (3) Machine Pump and Fire Engine: (4) Turret Clock, &c.; (5) Electric Telegraph, A B C Instruments, Bells, and Apparatus.
J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

B. DONKIN & CO.'S
IMPROVED GAS-VALVES



WITH WROUGHT-IRON PINIONS,
List of prices, with full dimensions of all sizes up to 48-inch, to be had on application.
These Valves are all proved on both sides to 30 lbs. on the square inch before leaving the works, and are always kept in stock.
VALVES MADE WITH OUTSIDE RACKS TO ORDER.
ALSO, SCREW WATER-VALVES WITH GUN-METAL FACES.
ALSO SOLE MAKERS OF
J. BEALE'S NEW PATENT GAS EXHAUSTERS.

B. DONKIN & CO.,
GENERAL ENGINEERS AND IRONFOUNDERS,
MAKERS OF STEAM-ENGINES,
BLUE ANCHOR ROAD, BERMONDSEY,
LONDON, S.E.



KÖRTING BROTHERS,
SOLE LICENSEES FOR
W. CLELAND'S PATENT STEAM-JET GAS-EXHAUSTER.

E. KÖRTING'S PATENT
STEAM-JET GAS-EXHAUSTER.
Small Cost—Compactness—Perfectly Self-Acting—Self-Regulating—Self-Cleansing—No Steam-Engine—No Attention—No Extra Room Required—No Wear and Tear—No Noise—No Oscillation in Vacuum, or Back Pressure.

UPWARDS OF 150 IN USE IN CONTINENTAL GAS-WORKS.
IN ENGLAND SUPPLIED TO—
Chartered Gas Co., London; London Gaslight Co., London; South Metropolitan Gas Co., London; Phœnix Gas Co., London; Liverpool Gas Co., Linacre; Corporation Gas-Works, Bolton; Cornholme District Gas-Works; Epsom and Ewell Gas Company; Horsham Gas Company; Gaslight Company, Ipswich; Gaslight and Coke Company, Cheltenham.

E. KÖRTING'S PATENT STEAM-JET REVIVIFYING BLOWERS FOR THE PURIFYING MATERIAL.

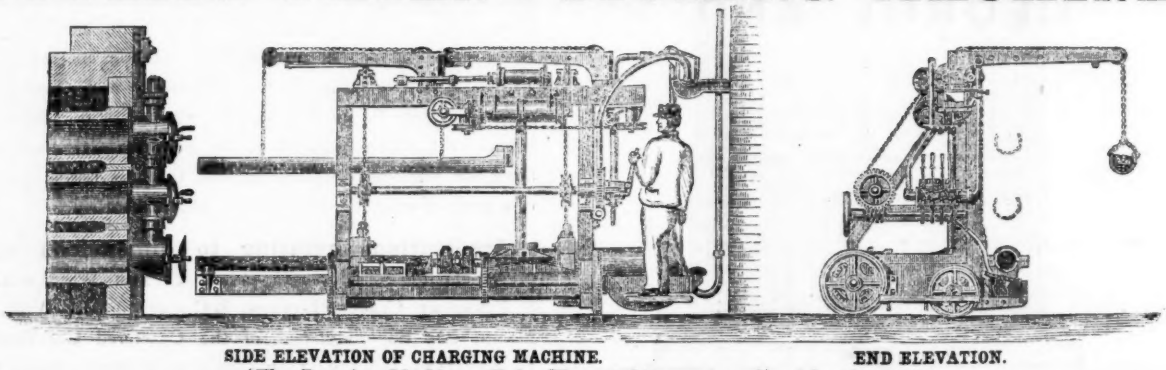
W. CLELAND'S PATENT STEAM GAS-SCRUBBER,
Combining small cost and thorough efficiency, with absence of any mechanical means and necessity of renewing the scrubbing material.

For particulars, apply to KÖRTING BROTHERS,
STEAM-JET ENGINEERS,
7, LANCASTER AVENUE, MANCHESTER.
CELLERSTR. 35, HANNOVER, GERMANY.
11, RUE LOUIS-LE-GRAND, PARIS.
1645, NORTH TENTH STREET, PHILADELPHIA, U.S.

KÖRTING BROTHERS,
STEAM-JET GAS-EXHAUSTERS AND REVIVIFYING BLOWERS FOR OXIDE.
LONDON AGENT AND AGENT FOR SOUTH OF ENGLAND:
GERALD J. TUPP, 8, John Street, Adelphi, W.C.,
To whom all inquiries for these districts should be addressed.

DEMPSTER, MOORE, & CO., 49, ROBERTSON ST., GLASGOW,
SOLE AGENTS IN SCOTLAND FOR KÖRTING BROTHERS.

FOULIS'S PATENT STOKING MACHINE.



SIDE ELEVATION OF CHARGING MACHINE. END ELEVATION.
(The Drawing Machine will be Illustrated in next week's Advertisement.)

Makers: TANGYE BROTHERS and HOLMAN, London and Birmingham; ADAM WOODWARD and SON, Manchester; ROBERT LAIDLAW and SON, Glasgow; MASCHINENBAU-ACTIEN-GESELLSCHAFT HUMBOLDT, Kalk bei Deutz;
Or all particulars may be had from JAMES WOTHERSPOON, 31, St. Vincent Place, Glasgow.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

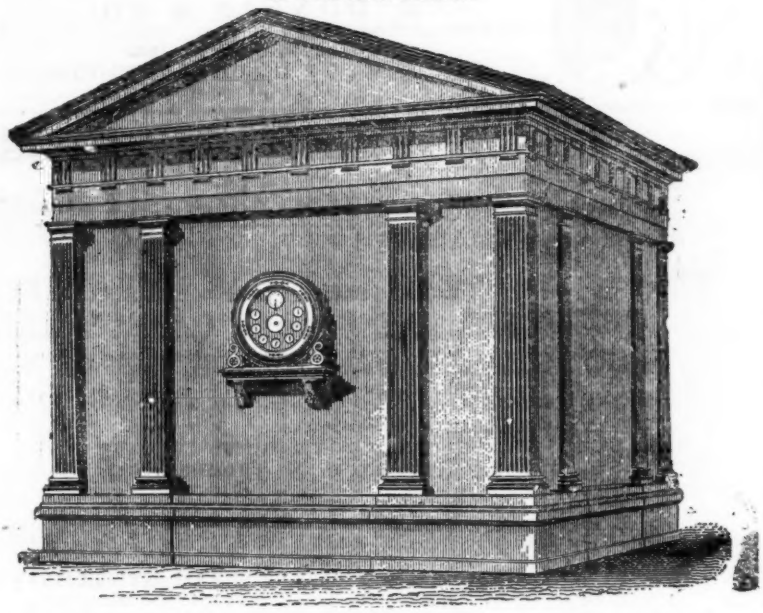
MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS

OF THE HIGHEST EXCELLENCE;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

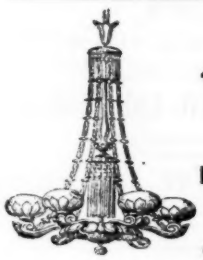
GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.



F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET. BIRMINGHAM.

ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

4, CANNON ROW, PARLIAMENT STREET, S.W.

MR. ANDERSON advises Companies on all matters connected with the manufacture of Gas and the construction of Works.

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS, heated by tar without the production of smoke.

STEAM-ENGINES and EXHAUSTERS, separately or combined.

FOUR-WAY VALVES, one of which is equal to three ordinary Valves.

STATION GOVERNORS—the Gasholder cannot tilt and cause accident.

BREEZE AND TAR FUEL MACHINE.

A Pamphlet containing Eighteen Illustrations of the foregoing, with letterpress of the construction of Works, post free, 2s. 6d.

N.B.—The second edition of this Work, *now ready*, contains Illustrations of the Machine for converting Breeze and Tar into Fuel for heating the Retorts.

"The Author is well qualified to speak authoritatively upon the important subjects to which his pamphlet refers."—*Artizan*.

THOMAS ALLAN & SONS, of Springbank Iron-Works, Glasgow, manufacture small cast-iron GAS AND WATER PIPES, 1½ to 6 inches, at their branch works, Stockton-on-Tees, and have at present a large stock, which they are open to sell at moderate prices.

CATHELS'S Patent District Dry Gas-GOVERNOR is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

CATHELS & TERRACE'S Patent Four-WAY DISC GAS-VALVE is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

WATER-MAINS.

COTTERILL'S PATENT STEEL TUBE-DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¾ to 2 inches and upwards. They cost less than the ordinary plan.

Apply to CHARLES FORSTER COTTERILL, Cannock, STAFFORD, Patentee.

BIRTLEY IRON WORKS,

CHESTER-LE-STREET,

DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD,

CITY ROAD, LONDON, N.,

Keep in London and at their works large stocks of PIPES and CONNEXIONS (1½ to 36 inches in diameter); also make and supply Retorts, Tanks, Columns, Girders, Special Castings required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

CHARLES HORSLEY, Agent.

BRAY'S PATENT "ENAMEL" REGULATOR GAS-BURNERS.

At the meeting of the North British Association of Gas Managers, held in Dundee in July last, the President, G. R. HISLOP, Esq., spoke very highly of a Gas-Burner, the name of which he did not give. In reply to letter from us, we received the following:—

"Gas-Works, Paisley, Aug. 17, 1875.

"Geo. R. Hislop, Engineer and Manager.

"Dear Sirs,—Your letter and circular referring to your Gas-Burners are to hand, and it will be gratifying to you to know that the Burners I referred to at the meeting of the North British Association of Gas Managers, held in Dundee last month, were your 'Regulator Burners.' I have not only purchased these exclusively for a considerable time past, but have very largely recommended their use to parties in different parts of the country—a fact, the bare mention of which should suffice to convey to you the high opinion I hold of the Burners of your manufacture. But, further, while second to the old iron burners only in price, they are second to none in the economic elicitation of light from a given quantity of gas, burned, of course, under conditions of pressure and volume proper to the size of each burner.

"I am, dear sirs, yours faithfully,

"GEO. R. HISLOP.

"Messrs. Geo. Bray and Co."

☞ *The Price is little more than common Burners.*

To be had of Dealers in Gas-Fittings throughout the World.

INTERNATIONAL EXHIBITION, 1862.

CLASS X.

PRIZE MEDAL

For excellence of Fire-Clay Gas Retorts, and "HONOURABLE MENTION" for good quality of Fire-Bricks.

WILLIAM STEPHENSON & SONS,

THROCKLEY,

NEWCASTLE-ON-TYNE.

B. CARPENTER,

THE ORIGINAL MANUFACTURER OF

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

WORKS:

22, HERMES STREET, PENTONVILLE ROAD,

LONDON, N.

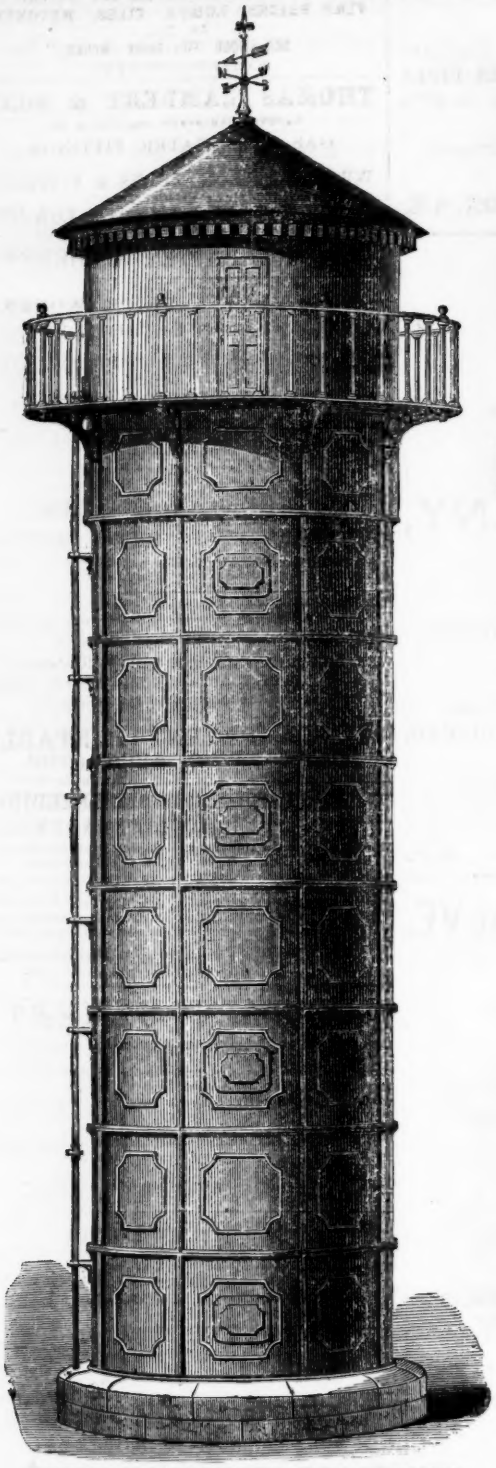
CLOTH GAS-BAGS FOR MAINS.

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather, India-Rubber and Gutta-Percha Machine-Bands, Sheet and Washers and Steam Joints.

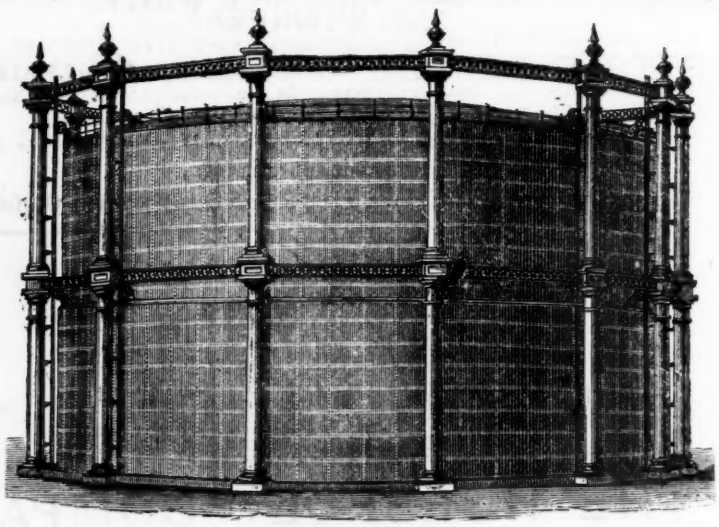
T. BUGDEN, Manufacturer,

79, GOSWELL ROAD, LONDON, E.C.

GEORGE WALLER & CO., GAS ENGINEERS,



SAME AS ERECTED FOR THE SWANSEA GAS COMPANY.



MANUFACTURERS OF

TELESCOPE AND SINGLE GASHOLDERS,
WROUGHT AND CAST IRON TANKS FOR SAME, BOILERS, GIRDERS, HYDRAULIC MAINS, ROOFS, &c.;
Coke Barrows, Stoking Tools.

SCRUBBERS, with MANN'S DISTRIBUTORS,
PURIFIERS AND CONDENSERS
(Wrought and Cast),
RETORT-HOUSE CASTINGS,
LAMP-POSTS, &c.; PATENT RETORT LIDS.

EVERY DESCRIPTION OF MACHINERY AND APPARATUS.
BEALE'S PATENT EXHAUSTERS,
WITH COMBINED OR SEPARATE ENGINES,
PUMPS, VALVES,
STEAM AND HYDRAULIC GOVERNORS,
HYDRAULIC AND STEAM MACHINERY FOR COAL LIFTING, &c., PURIFIER COVERS.

AWARDED a SILVER MEDAL at the MANCHESTER EXHIBITION of the SOCIETY for the PROMOTION of SCIENTIFIC INDUSTRY.

PHŒNIX ENGINEERING WORKS,
HOLLAND STREET, SOUTHWARK, S.E.,
and at **STROUD, GLOUCESTERSHIRE.**

SEE ALSO PAGE 699.

JOSEPH AIRD,
WELLINGTON TUBE-WORKS, TIPTON, STAFFORDSHIRE,

MANUFACTURER OF

EVERY DESCRIPTION OF TUBING, GAS, STEAM, HYDRAULIC TUBES AND FITTINGS,
EITHER BLACK, GALVANIZED, OR ENAMELLED HOT WATER TUBES AND FITTINGS,
CORE BARS, COILS, COCKS (IRON OR BRASS),
CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
HANDRAIL TUBINGS, IRON AND BRASS, PLAIN OR TWISTED,
TELEGRAPH TUBES OR POLES, &c., &c.

THE THAMES BANK IRON COMPANY,

(Successors to LYNCH WHITE,)

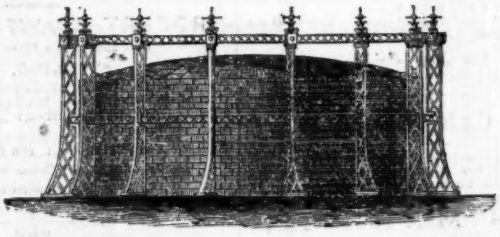
SUPPLY FROM STOCK

CAST-IRON RETORTS, SOCKET-PIPES for GAS or WATER PURPOSES, FLANGE-PIPES for STEAM, RAIN-WATER PIPES and GUTTERS, HOT-WATER PIPES and BOILERS, and all requisite Connexions for same; also LAMP-COLUMNS, LAMPS, WROUGHT FRAMES, WROUGHT-IRON TUBING, &c., &c.

All kinds of Gas-Works Apparatus and General Castings made to Pattern or Drawing.

ADDRESS—

OLD BARGE WHARF, UPPER GROUND STREET, LONDON, S.E.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

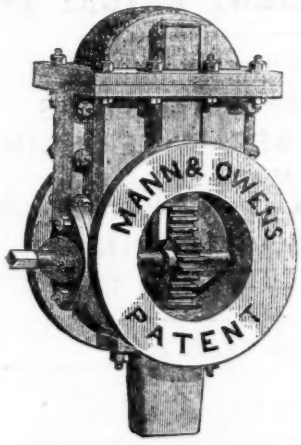
AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

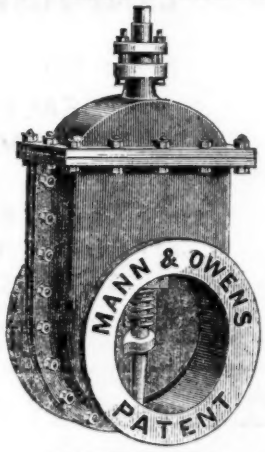
ALSO

MAKERS OF ROOFS, BRIDGES, &c.

MANN & OWENS' PATENT GAS-VALVE.



RACK AND PINION VALVE.



SCREW VALVE.

The advantages of this Patent Valve over all others yet introduced are, that it is always as tight as the best wedge or spring valve, without the possibility of setting fast or becoming suddenly leaky. The surfaces not being in contact during the operation of opening or closing, leakage through wear and tear is avoided.

The Gas Engineer will not fail to see the importance of such a valve in connexion with his purifying apparatus, particularly in the case of large sizes.

The slide being operated either by a screw and nut, or by a pinion and rack, a cam bearing upon a plane, cast on the back of the Valve, forces it against the face, and renders the escape of gas an impossibility. By a slight turn of the pinion or screw, the slide is released, and brought away from the face, by which means friction is avoided, and the only force required to open the Valve is that due to its own weight.

SOLE MANUFACTURERS:

S. OWENS AND CO.,

HYDRAULIC AND GENERAL ENGINEERS,

WHITEFRIARS STREET, LONDON, E.C.

PRICES, SIZES, AND FULL PARTICULARS ON APPLICATION.

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS,

&c., &c.,

SCOTSWOOD FIRE-BRICK WORKS,

SCOTSWOOD-ON-TYNE.

THOMAS LAMBERT & SONS

MANUFACTURE EVERY DESCRIPTION OF

GAS AND WATER FITTINGS;

ALSO,

WROUGHT-IRON TUBES & FITTINGS.

SHORT STREET, LAMBETH, LONDON.

TROTTER, HAINES, & CORBETT,

BRETTELL'S ESTATE

FIRE CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.

Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.

Successors to

E. BAKER AND CO., LATE BRIERLEY HILL, STAFFORDSHIRE.

MOBBERLEY & PERRY,

FIRE CLAY and BRICK WORKS,

STOURBRIDGE.

Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAY.

Manufacturers for Home and Export.

GAS-RETORTS, GLASS-HOUSE FURNACE, BLAST-FURNACE, TANK BRICKS, LUMPS, TILES,

And Every Description of Best Fire-Bricks.

ALPHA PATENT PORTABLE GAS-MAKING APPARATUS,

NOW MADE WITH

SELF-FEEDING ARRANGEMENT.

Specially constructed for Country use.

No. 2 . . . 25 lights, £30.

No. 3 . . . 60 lights, £55.

Larger and smaller sizes in course of construction.

H. L. MULLER, Patentee and Manufacturer,

22, MARY ANN STREET, BIRMINGHAM.

"SELLARS' CEMENT"

PREVENTS WASTE OF GAS FROM RETORTS;

SAVES CLAY RETORTS FROM DESTRUCTION BY FIRE;

GREATLY ECONOMIZES THE USE OF FIRE-BRICKS;

And PREVENTS ALL POSSIBLE LOSS of GAS FROM LEAKAGE.

J. C. SELLARS,

THE GAS CEMENT WORKS,

BIRKENHEAD.

LAMP-PILLARS,

GAS-LAMPS, FOUNTAINS.

Our New and Choice Designs for the above, with prices, are forwarded to any part of the world on receipt of twelve stamps. Estimates for work at home or abroad.

W. T. ALLEN & CO.,

GAS & WATER ENGINEERS & CONTRACTORS,

203, UPPER THAMES STREET,

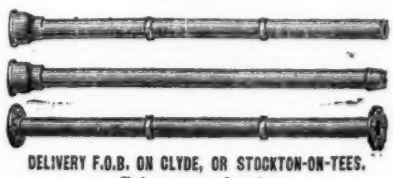
LONDON, E.C.

GAS AND WATER PIPES.

WILLIAM MACLEOD & CO.,

18 & 20, ALSTON STREET, GLASGOW.

CAST-IRON GAS AND WATER PIPES.



DELIVERY F.O.B. ON CLYDE, OR STOCKTON-ON-TEES.

Prices on application.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

173, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full Analyses on application.

ABRAM GAS COALS

from the

BICKERSHAW PITS, WIGAN,

Of the Abram Colliery Company, are worthy the attention of gas producers, showing a good yield of gas and a large residuum of excellent coke. When blended with one-seventh cannel, the gas is of specially high illuminating power.

Copies of analysis made at the Gas-Works, Salford, with an apparatus of full size, prices, and particulars of

BROCKELBANK BROTHERS,

11, LEADENHALL STREET, LONDON, E.C.

LORD DOUGLAS'S

(EARL OF HUME'S)

LESMAHAGOW

MAIN SEAM CANNEL COAL.

CRAIGNETHAN GAS COAL CO.,

LESMAHAGOW, N.B.

Analysis and Price on Application.

WYLAM WOOD COAL COMPANY,

LIMITED,

WYLAM-ON-TYNE.

WYLAM WOOD CANNEL COAL WORKED FROM ABOVE COLLIERY.

Analysis—10,280 cubic feet of gas per ton of Coal, having an Illuminating Power of 26·2 Sperm Candles, and yields 13¼ cwt of Coke per ton of Coal.

PORTS OF SHIPMENT:

TYNE DOCK AND NORTH DOCK, SUNDERLAND.

For prices and further particulars, apply to

UTRICK ALEXANDER RITSON,

6, QUEEN STREET,

NEWCASTLE-ON-TYNE.

AXWELL COLLIERY COMPANY,

Near **NEWCASTLE-ON-TYNE,**

SUPPLY CANNEL COAL FROM THE ABOVE COLLIERY.

Analysis—10,000 cubic feet of Gas per ton of Coal, having an illuminating value equal to 26 standard sperm candles, with a yield of 13½ cwts. of Coke per ton of Coal.

Supply also Gas and Coking Coals from the best seams.

Shipments at Tyne Dock and South Dock, Sunderland.

FOR PRICES AND FURTHER PARTICULARS,

APPLY TO

H.W. DODD & CO., 33, Quayside, Newcastle-on-Tyne,

OR TO THEIR LONDON AGENTS,

THOS. BROCKELBANK & CO., 115, Leadenhall St., LONDON.

TURNBULL, ROTBERG, & CO.,

LEITH,

SHIPPERS OF ALL DESCRIPTIONS OF

GAS AND STEAM COALS.

LONDON AGENT:

Mr. G. A. BARTLEET,

8, UNION COURT, OLD BROAD STREET.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in *practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12¼ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

Established 1840.

C. T. GRANT & CO. COAL BROKERS GLASGOW.

Scotch Churls

PRESENT PRICE:

5s. 6d. per Ton at Pit.

8s. 9d. ,, F.O.B.

Cubic Feet.	Illuminating Power.	Coke (sup. qual.).
10,000 ..	20 candles. ..	12 cwt.

C. & W. WALKER'S

WOOD PURIFIER SIEVES,

Which have now been used for twelve years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,

DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

8, FINSBURY CIRCUS, LONDON.

CANNEL COAL.

COPPA COLLIERY, MOLD,

Beg leave to call the attention of Gas Companies to the superior quality of their

CANNEL FOR GAS-MAKING PURPOSES.

This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.

Ports of shipment—Birkenhead or Connah's Quay.

Waggons supplied for delivery by railway to any part of England or Wales.

For particulars, prices, and rates of freight, apply to The Coppa Colliery, Mold, FLINTSHIRE.

SCOTCH GAS COAL.

ROBERT CRAWFORD & CO.,

GAS AND STEAM COAL MERCHANTS,

STIRLING, N.B.,

Supply and Contract for all the principal Scotch Gas Coal (including BOGHEAD, HARTHILL, CHAPELSIDE, LESMAHAGOW, and BRAEHEAD), f.o.b., or delivered at home or abroad.

ENGLISH AND WELSH COAL AND CANNELS ALSO SUPPLIED.

Analyses and Prices on application.

LONDON AGENT:

JOSEPH MOAKES, 6, WATER LANE, E.C.

THE

FRAMWELLGATE COAL COMPANY, DURHAM,

Are prepared to supply their

SCREENED AND NUT GAS COALS.

This Coal yields 11,000 cubic feet of gas and 13½ cwts. of coke per ton.

OFFICES: ROYAL EXCHANGE, MIDDLESBROUGH.

GAS COAL

Of every description delivered f.o.b. United Kingdom, or cost freight and insurance Abroad, upon lowest terms.

Contracts undertaken for the Shipment, Insurance, and Delivery Abroad of Plant and Materials for Gas and Water Works, &c.

THOMAS BROCKELBANK & CO.,

Coal Exporters and Ship and Insurance Brokers,

115, LEADENHALL ST., LONDON.

G. A. BAILEY AND CO., Machinists, Manufacturers of all kinds of Indexes for Gas and Water Meters, Indicators, Tell-Tales for Turnstiles, on an improved principle. Every description of Wheel and Worm Cutting, &c.

86, Crampton Street, Newington Butts, LONDON, S.E.

N.B.—Country Orders executed with despatch.

GEORGE FLINTOFF, C.E., 4. Spring Gardens, Charing Cross, London, who originated the cheap gas movement in London and the provinces in 1848, ERECTS and ENLARGES GAS-WORKS. May be consulted in Valuations, Rating Cases, Public Lighting, and all matters relating to the supply of gas.

G. J. EVESON,

GAS COAL MERCHANT,

STOURBRIDGE.

Delivery per Rail to any Part.

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD,

STRONGLY RECOMMEND A TRIAL OF THEIR

CELEBRATED SILKSTONE GAS NUTS.

Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

(Successors to JOHN WILLIAM O'NEILL & CO.,)

Offices—PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.,

CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.

The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

JOHN WILLIAM O'NEILL, SAMUEL H. JOHNSON, } Joint Managing Directors.

ALBERT GAS COAL.

THE DERBYSHIRE

SILKSTONE COAL COMPANY, LIMITED,

CAN OFFER A

GAS COAL

Of superior quality, delivered at any station in England and Wales.

Purified gas per ton of coal in cubic feet (average)	10,775
Weight of coke in lbs. per ton of coal	1,465

ANALYSIS AND PRICES ON APPLICATION TO

Mr. EDMUND TAYLOR, Secretary,

ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.

THE LOCHORE AND CAPLEDRAE CANNEL COAL COMPANY, LIMITED.

Works: LOCHORE by LOCHGELLY, FIFESHIRE. Office: 19, MAITLAND STREET, EDINBURGH.

This Company request attention to the very superior quality of their Cannel Coals.

1. The following are the practical results given by Dr. Wallace, of Glasgow, of analyses of their Lochore and Capledrae Cannels:—

	Sample worked at Capledrae.		Sample worked at Lochore
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure . .	13,095 cubic feet.	..	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91	..	34·83
Value of 1 cubic foot of gas in grains of sperm	780	..	836
Equivalent of a ton of coal in pounds of sperm candles	1,459	..	1,404
Durability of 1 cubic foot by 5-inch flame	69 minutes.	..	71 minutes.
Gravity of the gas (air = 1000)	596	..	594

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

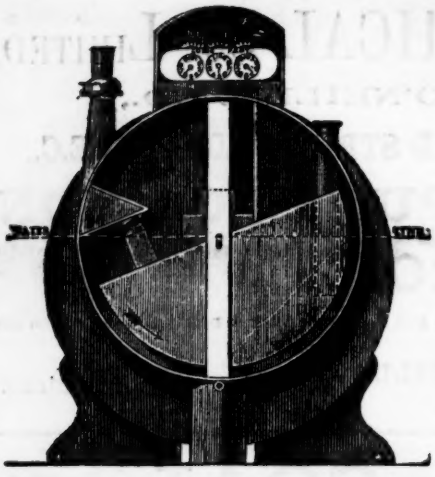
	Capledrae Waverley.		Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	9,120 cubic feet.	..	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·62	..	33·09
Value of 1 cubic foot of gas in grains of sperm	878	..	794
Equivalent of a ton of coal in pounds of sperm candles	1,145	..	1,264
Durability of 1 cubic foot of gas by 5-inch flame	80 minutes.	..	67 minutes.
Gravity of the gas (air = 1000)	677	..	597

Remarks on the Sample of Capledrae Waverley.—This Coal gives fully 9000 feet of gas of 36½ candles, and is admirably adapted for bringing up the quality of gas made from common coal or inferior qualities of cannel. The tests were made at a rather high temperature, this being one of the coals that stand a very high heat without serious diminution of the illuminating power of the gas The coke contains 60 per cent. of ash, and is therefore almost valueless, but the proportion of sulphur is very moderate.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

Applications for full Copies of Analyses and Prices may be made to the Company, at

19, MAITLAND STREET, EDINBURGH.



THE

UNVARYING WATER-LINE GAS-METER.

(SANDERS AND DONOVAN'S PATENT.)

"Unquestionably the best Water Gas-Meter now in use."—Thos. G. Barlow, C.E.

Over 90,000 in action.

MANUFACTURERS

THE GAS-METER COMPANY,

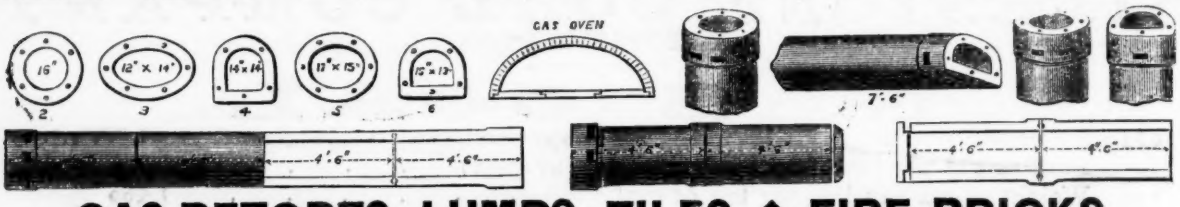
KINGSLAND ROAD, LONDON;

WITH

Branch Manufactories at DUBLIN and OLDHAM.

HARRIS & PEARSON,

FIRE-CLAY AND BRICK WORKS, STOURBRIDGE.

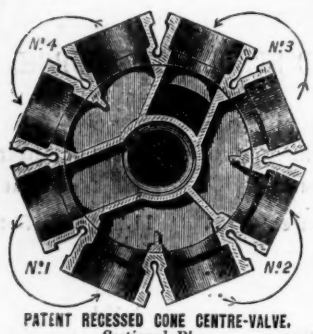


GAS-RETORTS, LUMPS, TILES, & FIRE-BRICKS,

OF EVERY DESCRIPTION.

A LARGE ASSORTMENT OF GAS-RETORTS IN STOCK.

STOCK FOR EXPORT READY AT THE WORKS, AND AT ELLESMERE PORT.



PATENT RECESSED CONE CENTRE-VALVE.
Sectional Plan.

R. LAIDLAW AND SON,

EDINBURGH AND GLASGOW,

SOLE MAKERS OF

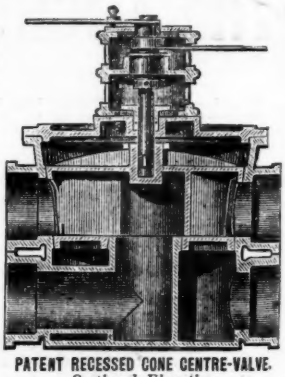
PATENT

RECESSED CONE CENTRE-VALVES,

Constructed on the principle of the ordinary Plug-Cock.

THROUGH-WAY & FOUR-WAY COCKS

Of all descriptions.



PATENT RECESSED CONE CENTRE-VALVE.
Sectional Elevation.

LONDON OFFICE: 106, CANNON STREET.

D. HULETT and CO., 55 and 56, HIGH HOLBORN, LONDON,

PATENTEES and MANUFACTURERS of the ONLY GOOD MERCURIAL GAS REGULATOR

Invite the attention of Gas Companies and the Trade generally to their Improved GAS-METERS, which they warrant equal to any in Quality, Workmanship, and Simplicity of Construction, and the only Meters from which Gas cannot be obtained without being duly registered.

MANUFACTURERS OF

GAS CHANDELIERS, GLASS LUSTRES, HALL LANTERNS, VESTIBULES, BRACKETS, PENDANTS;

DOUBLE CONE, ALBERT, SHADOWLESS, & EVERY DESCRIPTION OF BURNER, UNION JETS, BATSWINGS, ETC.;

IMPROVED FULL-WAY CARTER'S VALVES (much approved of);

GAS-STOVES, and every article connected with Gas Apparatus.

CAST & WROUGHT IRON PIPE, BLACK & GALVANIZED. COPPER, TIN, BRASS, & COMPOSITION TUBING.

D. HULETT'S IMPROVED SERVICE CLEANSER

for clearing out Mains, Services, and Interior Fittings—65s. net.

Boyle's Patent Silvered Glass Combination Reflectors and Outside Lanterns.

Sole Manufacturers of Church and Mann's Photometer.

Large Pattern-Books, with every description of Gas-Fittings, Chandeliers, &c., with complete Book of Prices, 12s.

London: Printed by William Boughton King (at the office of Clayton and Co., 17, Bouverie Street, Fleet Street); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, November 9, 1875.